JPRS 77092

2 January 1981

China Report

SCIENCE AND TECHNOLOGY

No. 75

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 77092	2.	3. Recipient's Accession No.
4. Title and Subtitle CHINA REPORT: SCIENCE AND TECHNOLOGY, No. 75			5. Report Date 2 January 1981
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.
			11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covere
			14.
15. Supplementary Notes			

16. Abstract (Limit: 200 words)

This serial report contains articles, abstracts and news items on national developments in science and technology; and physical, applied and life sciences in China.

17. Document Analysis a. Descriptors

CHINA
National Developments
Chinese Academy of Sciences
Physical Sciences
Applied Sciences
Life Sciences

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 01, 02, 04, 06, 07, 08, 09, 11, 12, 13, 20

18. Availability Statement: Unlimited Availability Sold by NTIS Springfield, Virginia 22161	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 49
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 77092

2 January 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 75

CONTENTS

APPLIED SCIENCES

Design of Diagnostic System of 151-2 Computer Described
(Li Yanhong; ZHONGXIAOXING JISUANJI, 25 Jul 80) 1

303-1 General Wage Program Introduced
(Chen Shengdong; DIANZI KEXUE JISHU, 4 Oct 80) 38

DJS130-PZ5 Interface Operation Detailed
(Fu Shouchun, Gu Haoran; DIANZIJISHU, 20 Mar 80) 44

APPLIED SCIENCES

DESIGN OF DIAGNOSTIC SYSTEM OF 151-2 COMPUTER DESCRIBED

Liaoning ZHONGXIAOXING JISUANJI [MINI-MICRO SYSTEMS] in Chinese No 3, 25 Jul 80 pp 1-16, 30

[Article by Li Yanhong [2621 1750 7703] of Changsha Engineering College: "Microdiagnostic System of the 151-2 Computer"]

[Text] Abstract

This article describes the design of the diagnostic system of the 151-2 computer, mainly the principle of microdiagnosis, the hardware core, the design of the diagnosis of microprograms, automatic test of the hardware core, method of generation of the test code and its advantages, diagnostic commands system and its function and mode of operation, basic program block diagram with special emphasis on pointing out the function of this system, the indicators of performance and its practical value in the diagnosis of medium and small computers.

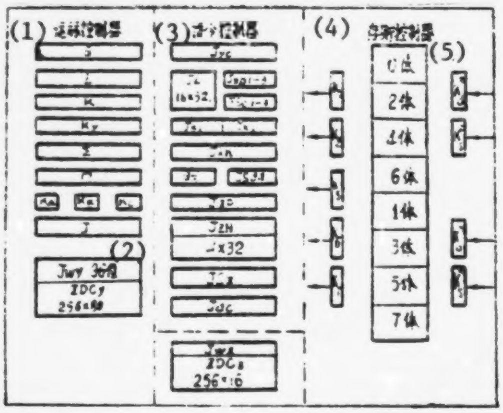
I. Introduction

As integration of digital computers develops and the function and application of the machines expand, the demands upon the realiability and maintenance ability have become more and more urgent. Therefore, in recent years, techniques of diagnosis of computers have been studied in our nation and abroad to adapt to this situation. A relatively complete diagnostic system has been designed for the major parts of this computer.

The diagnostic means are determined by the type of malfunction (fault). They generally can be classified as frequently occurring fixed malfunctions and chance and intermittent malfunctions. The former can be further divided into simple malfunctions and multiple malfunctions. Also, diagnosis of fixed malfunctions is the main purpose of diagnosis and diagnosis of intermittent malfunctions auxiliary. Diagnosis of malfunctions is the main purpose of diagnosis and function audits are auxiliary. According to ordinary understanding, diagnosis is to divide the machine logically into several diagnostic regions (test regions). The control unit sends a test code to its input end and observes the response of that circuit at the output end, i.e., retrieving the test result and then by a comparison of the test result and the standard results, decide the area of the malfunction. Here, because the sources of the hardware and the software used in the process are not the same, the types and effects of diagnosis will be very different. When the machine's hardware and commands are used to carry out diagnosis, we are using an audit program to carry out function audit. When special diagnostic equipment and special diagnostic commands are used to carry out diagnosis, we are using a diagnostic program to carry out diagnosis of malfunctions. This machine uses the latter and it is microdiagnosis, this means using a microprogram composed of a series of microcommands to diagnose malfunctions of a microchannel. This can be easily realized by microprogram controlled machines.

II. Block Diagram of the Processor

To understand the object of diagnosis, a simple block diagram of the processor is drawn for illustration.



Block Diagram of Processor

Key:
(1) Computation controller
(2) 96 digits
(3) Command controller
(4) Memory controller

(5) 0 part
2 part
4 part [etc]

(I) Total System Function Indicators

The main frequdncy is 2.5 MC. The speed is 600,000 times per second. There are two word lengths: The single word length is 32 bits, the double word length is 64 bits. The main memory has 65,00 words (which can be expanded to 260,000 words). Two systems are used. The memory combination is a dual system modulo 2 or a single system modulo 1. The operational cycle of the main memory is 1.2 us. There are 64 channels for peripheral equipment (half for special equipment and half for general purpose equipment). The computer has a relatively complete peripheral equipment. In particular, it has two kinds of peripheral equipment (narrow line printer and capacitance input device) which can be directly hooked onto the processor for diagnosis and debugging the machine.

It has a complete memory control unit, a command control unit and an operational control unit. The command control unit uses a definite degree of precontrol techniques. The memory control unit uses a time-shared queuing technique. The main memory is modular. The operational control unit is microprogrammed (standardized operational control).

(II) Structural Characteristics

The core unit multiplier (Π) of the arithmetic unit and the full adder (Σ) are connected in series as a unit. There is a bus switch. The results of computation are sent to the results register (J_{YC}) via the shift switch (K_Y) and the bus switch (K). There is a dual channel structure. The registers S, L (the first operational digit registers) and J (the second operational digit register) have a channel that directly passes through the bus switch. There is also a channel to the bus through the multiplier-full adder. The arithmetic unit also has an N counter unrelated to the bus switch, a Kn counter switch and some independent status triggers.

The operational control has a microprogram memory ZDC_Y, microcommands register J_{WY}, decoder YM_Y and some control conditions.

The main functional units of the command control unit are: entry command address counter JS_Z, command control unit's current-command address adder Q_Z, operational control unit's operational command address counter (break point) JS_{dd}, command queuing unit (analyzer(J_{ZP}, general purpose accumulator register J_L, results register J_{YC}, command buffer register J_{ZH}, request trigger and a counter that controls the entry and exit of commands.

The memory control unit has a queuing unit, address transformer, address switch and numerical code switch.

III. Principles of Diagnosis

(I) Mode of Operation

This diagnostic part is hidden inside the processor's diagnostic controller. It has an independent hardware and software system by which it performs diagnosis of the operational control unit. Therefore it is similar to the method of an internal "diagnosis by an outside machine." The actual process of operation is to generate the needed test codes and to record the programs and data on a data tape (punched paper tape, magnetic tape). At the time of diagnosis, the test codes are transferred into the main memory. After start-up the test code under the control of the diagnostic control unit is accessed and loaded onto the unit to be diagnosed via the sweeping unit. The test results are retrieved into the diagnostic unit and compared with the standard results accessed from the main memory. Finally, a decision is made as to correctness and thus a group of test results is obtained. When all the test groups in that test region have been tested, they are comprehensively analyzed. The fault is fixed accurately according to the diagnostic dictionary and the results are finally printed.

(II) Marking Out the Test Regions

The scope of the test regions depends upon the tested logic function block and determines the problem of determining the test codes.

The nature of marking out the test regions is marking out of the test channels. Therefore marking out the regions is not a random division of the entire logic unit because if so, some unnecessary test channels will surely be added, and the purpose of testing the original logic channels may not even be fulfilled.

The order of marking out the test regions facilitates isolating the problems. Therefore, testing regions are ordered from the small to the large and from the inside to the outside. A smooth testing of the test regions in front provide the possibility of testing the test regions that follow. The latter relies upon the front region to pass on the test code. The latter is a newly added test channel, i.e., a new test region. In this way, the order of the test region reflects the snowball method of testing.

(III) The Method of Peripheral Equipment

In the process of loading the test code and transmitting and retrieving the test results, the original data channels must all be opened. The microaction signals needed here cannot be directly accessed from the operational control unit's microprogram memory because their arrangement does not suit the needs of microdiagnosis. Therefore, the method of adding equipment to the microcommand register must be used.

IV. Hardware System

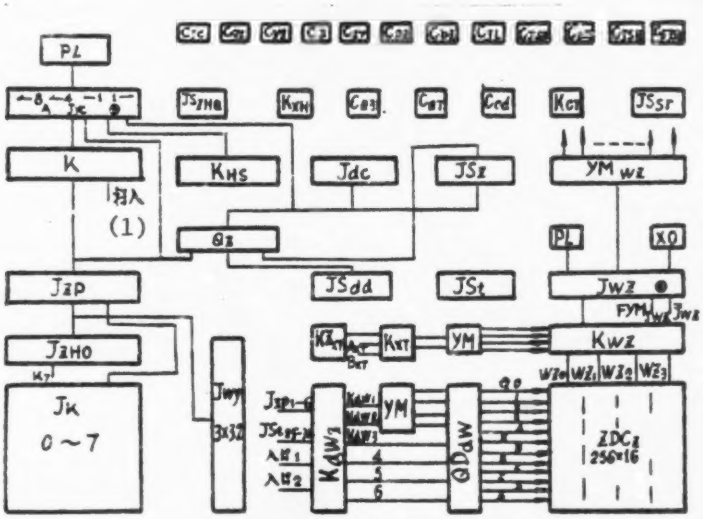
(I) Hardware Block Diagram

K	Output bus switch of the operational control unit used here as a sweep-in unit;
J^{Q}_{yc}	Register of the output results of the command control unit, used here as the retrieving register and comparison register (containing comparison circuits);
J_{ZP}	Command queuing device of the command control unit, used here as the diagnostic commands register and the digital code buffer register.
JS_{Z}	Entry counter of the commands of the command control unit used here as the diagnostic commands counter;
J_{dc}	Stored data address register;
JS_{dd}	Breakpoint counter of the command control unit used here as a variable address register;
J_{K}	Switch register of the command control unit used here as the surface board switch number during autotest;

J_{st}	Time counter of the command control unit used here as the entry address of the diagnostic read only memory during autotest;
JS_{ZHQ}	Commands request number counter of the commands control unit used here as the peripherally installed operational control unit's microcommand word counter (32 digits per fixed equipment);
JS_{sr}	Input commands' input message counter;
Q_{Z}	Command control unit's current command address adder used here as the variable address adder;
ZDC_{Z}	Diagnostic read only memory (microprogram memory);
J_{WZ}	Diagnostic microcommand register;
K_{WZ}	Diagnostic microcommand register's input switch;
YM_{WZ}	Diagnostic command decoder;
K_{XT}	Diagnostic microprogram selector switch;
KZ_{XT}	Diagnostic microprogram selector control;
Kd_{WZ}	Entry address switch of the diagnostic read only memory;
QD_{dWZ}	Address drive of the diagnostic read only memory;
PL	Decide "0" circuit;
XO	Parity checking circuit;
C_{Q7}	Access command request trigger of the command control unit used here as the request trigger for accessing commands and data;
C_{Q3}	Stored data request trigger;
C_{gZ}	Diagnostic process signal trigger;
C_{yg}	Malfunction signal trigger for diagnosis;
C_{Z}	Clocked diagnostic work cycle control trigger;
C_{ZY}	Operational control command decoder trigger for diagnostic control;
C_{cd}	Length signal trigger;
C_{PZ}	Beat signal trigger used in the cycle of operational control commands;
C_{bZ}	Polarity selection and control trigger of the diagnostic work clock;

C^*_{SR}	Signal trigger for sweeping into the ith channel or the jth channel when testing the accumulator register;
C^*_{JSR}	Signal trigger of the input commands to send data;
C^*_{JSD}	End of input signal trigger;
C_{CT}	End of printout signal trigger;
K_{XH}	Wrong stop switch;
K	Cycle switch;

Of these, except for the microprogram used as the main control of diagnosis, the majority also uses the main functional units of the command control unit. Here, the main diagnostic function units are J_{ZP} and $J_y{}^Q{}_c$. The former is a command control unit. The latter is a diagnostic analysis unit. The microprogram is a control unit of diagnostic operation. It is the memory's logic unit that executes the various microactions of the diagnostic commands.



Block diagram of hardware

Key: (1) Sweep in

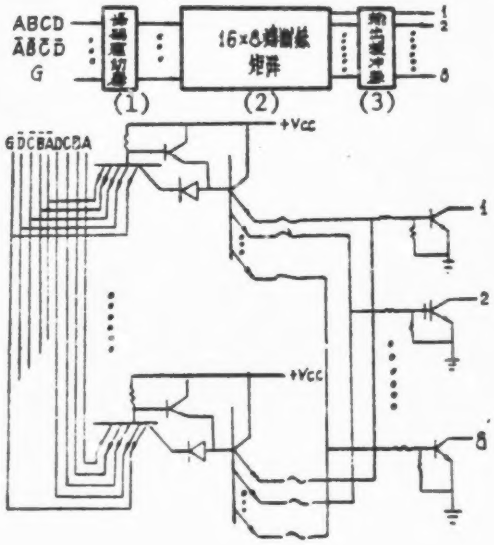
(II) Design of the Diagnostic Microprogram

Since the technology of designing microprograms as a memory logic unit came into being, it has received popular attention in our nation and abroad because of its advantages. In foreign nations, this has already become reality. In our nation, it used to be something that could only be dreamed about. But since the successful trial development and popularization of the medium scale integrated circuit read only memory component (PROM) in our nation, small, medium and large computers with microprogrammed controls have emerged one after the other. Although they are all controlled by microprograms, the emphasis is not the same when considering the designs of the microprograms. For small computers, speed is not the main problem, therefore the point of consideration is how to solve the problem concerning conflicts between the development of the advantages of the design of microprograms and improvement of the speed of the machine. Concerning this point, the 151-2 model's operational control microprogram design has already become an example. The design of the diagnostic microprogram supporting it must take into consideration the problem of speed and the problem of conservation. This is one of the guiding thoughts in the design of the diagnostic microprograms of this system.

1. Structure of the Control Unit of the Diagnostic Microprogram

(1) Microprogram Storage ZDC_Z

It consists of a 4 x 64 x 16 matrix, the 4 x 64 x 8 is an inserted unit. Thus two inserted boards form 256 words x 8 bits (sharing one board with the ZDC_y of the operational control unit). They are divided into four parts. Each part has 4 chips. Each chip has 16 words x 8 bits. These 8-bit messages are realized by a nickel-chromium fused filament (See component logic diagram). This is a four-part parallel read-out structure to facilitate increasing the machine's speed. For the 25 diagnostic commands and the autotest "program blocks," the 256-unit capacity will never be used up. This seems to be a waste. This is because the use of the standard board of the operational control unit reduces the backup boards needed but when the units not being used form 16 continuous words, these components will not have to be welded or can be welded but not etched to serve as a backup. In this way, there will be no waste. A word length of 16 bits is bearly sufficient to perform such microfunctions of so many commands as accessing commands, accessing data and performing diagnostic operations. This is precisely the problem that is characteristic of this microprogram design and that needs to be solved.



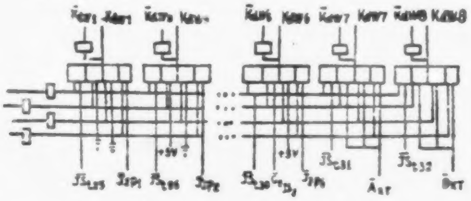
Key:
(1) Decoding drive
(2) 16 x 8 fuse matrix
(3) Output buffer

PROM components logic diagram

(2) Entry Address Switch K_{dWZ}

The method of addressing of the microprogram storage is chip selection (each chip), word selection and part selection. K_{dWZ} has 8 bits, $K_{dWZ1,2}$ is used for chip selection after decoding; K_{dWZ3-6} is used for word selection (the component contains a decoding drive) via the address drive inside the inserted unit; $K_{dWZ7,8}$ is used for part selection.

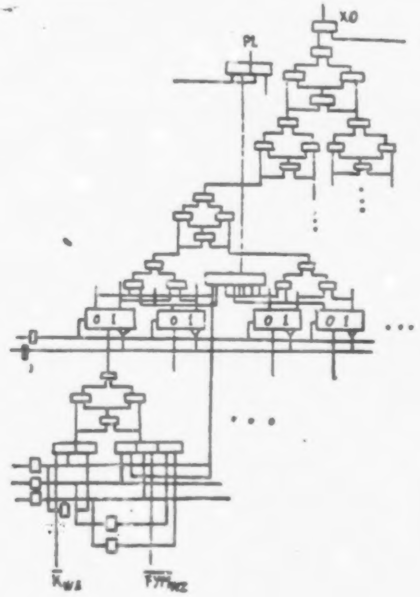
This switch has a total of four channels, i.e., four entry address sources: (1) entry address at time of autotest. It originates from the timer $JS_{t\ 25-32}$. This shares the JS_t of the command control unit and uses it as the hardware core of the hardware for automatic testing and diagnosis; (2) When the diagnostic program functions and operates the code channel, it uses the operation 1 codes of the commands as the addresses of the microcommands (not through encoding). They originate from the operational codes of the J_{ZP} queuing device (actually, they originate from the dead wait counter JS_{sd}, because it also stores operational codes, and in addition, the names of these components all retain the original calls of the command control unit, and diagnosis only shares them, the same in the following); (3) Entry 1 channel is the entry address into the diagnostic program after automatic tests of two groups of counters and after completion of automatic tests and after they are ready to be entered into the diagnostic program. These two groups of counters are diagnostic components and they also share the command control unit. Readiness for entry into the diagnostic program includes the "diagnostic program procedure" signal trigger C_{gZ}, and accessing of the surface board commands to the queuing device (register) J_{ZP}, and the commands on the surface board J_{K7} are the shut off commands or unconditional transfer instructions. When automatic tests end and the diagnostic program needs to be input, the shut off command is placed on J_{K7} and the input command is placed on J_{K0}. If the program has already been input into the main memory, the unconditional transfer commands are placed on J_{K0} (transferring to the entry of the diagnostic program). Any one of the two types of commands mentioned above can be placed on J_{K7} and any one can be transferred to the commands on J_{K0} because when automatic testing ends, the command counter JS_Z is cleared and set at "0", and the commands are transformed to the No 8 unit. J_{K0-7} occupies the No 8 to No 15 addresses of the main memory; (4) Entry 2 channel is the entry address for accessing commands and data. Since these functions are shared, a common entry is given. The logic of K_{dWZ} is illustrated below.



Entry switch Kd_{wz} logic diagram (using standard inserted components to realize it)

(3) Microcommand Register J_{WZ}

It is a 16-bit register composed of the D trigger. The D trigger has a function of "supporting the top and opening the bottom." Its logic is shown in the following diagram.



J_{WZ} and its channel logic diagram

The input channels are:

(a) K_{WZ} channel is the microcommand read out channel;

(b) FYM_{WZ} channel is the channel of the automatic test decoder;

(c) BC channel is the retention channel but it is not used for cyclic use by the microcommands. It is set up to search for modulo 2 plus (search for the sum of the command codes;

(d) All clear "0" channel is the ZZ "0" $J_{WZ}(R)$ channel set up so that debugging and normal operations will not be affected by diagnostic microactivity.

Support installations are:

(a) Decide "0" circuit is for deciding the codes and full "0" during automatic testing, i.e., for longitudinal parity check.

(b) Parity checking circuit is the horizontal parity check set up to monitor the correctness of the microprogram storage when the microprogram is in operation.

These checking circuits will immediately stop the machine when errors are discovered at different stages.

(4) Decoder YMZ

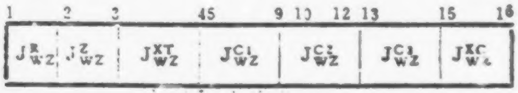
(a) Uncontrolled decoding;

(b) Controllable decoding to conserve the use of read only memory and it is even irreplaceable.

To facilitate testing and searching for the sum of the codes during automatic testing, all the standard inserted decoder units have a reverse decoding circuit and they must be able to retrieve all coded dots without hindrance. Therefore the control conditions are added onto the second level decoding circuit (forming an unstandardized control board).

2. Format of Microcommands and Division of Syllables

Because the standard read only memory inserted chip is used, the format of microcommands and division of syllables are necessarily limited in some ways.



Format of J_{WZ}

(1) Syllable Distribution

Many formats of microcommands of microprogram designs contain various types of characteristic digits, such as lower microcommand addresses, transfer condition codes, checking digit, and operational syllables etc, but this design has set up only two-digit characteristic signals according to the actual situation, two digit selector syllables and three operational syllables and a one-digit checking digit.

(2) Function of Each Syllable

(a) J^R_{WZ} is called the entry address signal digit. When the diagnostic program is in operation, $J^R_{WZ} = 1$. It signifies the operational code has been accessed as the entry address. $J^R_{WZ} = 0$ signifies that the entry 2 of a fixed microprogram has been accessed at the entry address.

(b) J^Z_{WZ} is called the transfer signal digit. $J^Z_{WR} = 1$ is unconditional transfer, i.e., the transfer condition is accessed and the selector address is decided according to the related selector logic.

(c) J_{WZ}^{XT} is called the selector syllable, totalling 2 digits called A_{XT}, B_{XT}.

(d) J_{WZ}^{C1} is called the first operational syllable, totalling 5 digits.

(e) J_{WZ}^{C2} is called the second operational syllable, totalling 3 digits.

(f) J_{WZ}^{C3} is called the third operational syllable, totalling 3 digits.

(g) J_{WZ}^{XD} is called the parity checking digit.

3. Selector Control

The course of the microprogram like ordinary programs, will encounter the problem of transfers of conditions. Therefore usual design of microprograms must solve the problem of transfer of conditions of the microcommands. There are the following methods:

(1) Setting Up Condition Coding Syllabes

Especially in medium and large computers, there are many conditions in the course of computation and condition coding syilables must be set up. At the time of start-up, a "call" is made according to the code number. If the called condition is satisfied, the selector's direction is thus decided by the related selector logic. Unconditional transfer are also given code numbers. They will select and access the part address on the address syllable as the selector address. This is the plan for the 151-2 computer's operational control microprogram to process transfer of conditions.

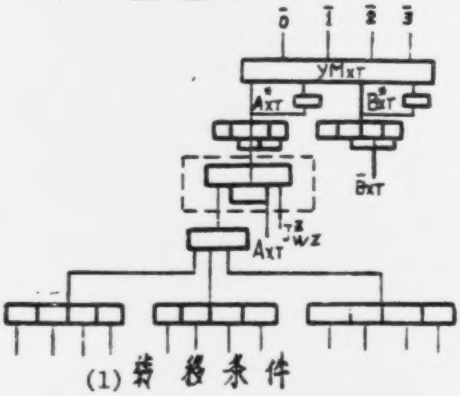
(2) Setting Up the Conditions Signal Digit

In the small computer, the word length of the microcommands should be shortened, especially since the word length in this plan has already been limited to 16 bits, thus if condition coding syllables are also set up, there will not be much left. Based on this situation, to solve the selector problem is the key of this plan. Here, a condition signal digit J_{WZ}^{Z} is set up. Its function is described above. Here we must give a follow up explanation of the problem of conditions. Under this situation, the many conditions must be limited: The problem of whether that condition is satisfied or not will only come about when in use. When not in use, all conditions are in the returned to "0" state, i.e., not satisfying any condition. This means when they are not called, they must not be satisfied. Therefore "calls" can be eliminated. When the conditions are concretely analyzed, all of them fall into only two categories: one has only one beat and the other has many beats. For example, transfers due to switching such as K_{XH} and PL_1. For these very few conditions, a coding for "access x condition" must be given by the operational syllable. In this way, these conditions only have one beat.

(3) Determination of the Number of Directions of Transfers

In the design of the operational control microprogram of this machine, there can be five directions for selection. There are four to the selector and one in the cyclic direction towards maintaining J_{WY}. Here, a retention logic is not set up and the cyclic direction is included in other transfer directions. In this way, there are four selectable transfer directions, i.e., one of the outputs of the four parts on the entry of J_{WZ}. It can be seen from a comprehensive analysis of the microprogram operations table of diagnostic commands that the possibility of having three transfer directions is extremely rare, mostly two transfer directions. Thus the method of inserting an empty box in the microprogram and using a controllable decoding program are both regarded as two directions. In this way, the selector logic is greatly simplified.

For the control selector to be simple numbering of the two directional parts should be limited to 10, 00 of 11, 01. Filling in 10 or 11 in the syllable of J^{Z}_{WZ} means the part number of the direction of a successful transfer. The part number of the direction of an unsuccessful transfer is 00 or 01. It can thus be seen that the state of B_{XT} does not change. When a transfer is successful only the state of A_{XT} is changed.



Selector logic diagram (the selector switch is in the dotted block)

Key: (1) Transfer condition

4. Operational Entry Channel Control

Because the limitation on the word length of J_{WZ}, a "lower address" syllable is not set up but is represented by the operational code. The operational code serves as the entry address and as the lower address, i.e., the operational code channel is maintained until that command has completed its operation and then it changes to the common fixed entry 2 for commands to gain access. In general, one command can use up the microcommands of a maximum of four parts. This control is accomplished by J^{R}_{WZ} as previously described simply by writing a "0" for the J^{R}_{WZ} digit of the last operational microcommand of each operational command. In the operational microprogram of some commands, a decision whether to transfer to the fixed entry 2 must be based on the condition (see non- "0" entry command in the Appendix). In this way, J^{R}_{WZ} has two possibilities. For uniformity, the command must be led into an empty operational microcommand block. If four parts have already filled up the blocks and there are no empty blocks to be used, a logical method can be used as a solution such as the analytical command (see Appendix 1).

After the microprogram in the fixed entry 2 has been executed and completed, a switch to the operational program of that command must be made. This means opening the operational code channel. At this time, "1" is written for the J_{WZ}^{R} digit. But if it is an unconditional transfer command, the action involves computing the transfer address and then sending out a request to access commands. These functions belong to the fixed entry 2, but J_{WZ}^{R} in the microcommand for computing the common address to access data remains constant as "1", and therefore the command cannot be transferred to the common microcommand to access commands, and thus an empty block must be inserted.

The above described the main part of the diagnostic microprogram controller. Some reliability measures must be taken to assure operational reliability, such as strict screening of read only memory components as well as measures of automatic testing.

(III) Automatic Testing of the Hardware Core Units

For the diagnostic program to function properly, the diagnostic components must be automatically tested, called an autotest. An autotest consists of two stages, a longitudinal test stage and a microprogram autotest stage.

1. Longitudinal Test Stage

Testing the read only memory of the diagnostic control memory, the microcommand register and the decoder is called a longitudinal test. It is an accumulation of each digit of all the unit messages in the memory, i.e., obtaining an accumulated sum. To be able to judge the accuracy of the accumulated sum sought, it needs to be compared to a standard result. This standard result consists of all odd parity digits of all unit messages, i.e., a longitudinal set of odd forms. If the accumulated sum obtained at the end of the longitudinal test is "0" then there is no error. Conversely, the accumulated sum may be wrong, or there may be a certain digit in the read only content that is wrong, or maybe a certain digit in the microcommand register is wrong. Such errors can be discovered only after completion of the longitudinal check. Therefore which unit is wrong cannot be known. The duplicate can be used to check the digit where there is an error. The testing of the decoder is conducted similarly by making the decoder reverse its decoding (encoding). The hardware core unit needed for the longitudinal test is the time counter JS_t which can carry out continuous addressing. Computing the accumulated sum is conducted on the modulo 2 plus circuit at the entry point of the microcommand register J_{WZ}. The result is registered in the J_{WZ}. When an error is discovered, the machine is shut off automatically. Then the channel of the modulo 2 plus search is switched off, leaving only the read only direct transmission channel, and using the microcommand coincidence switch, the wrong digit can be checked command by command and syllable by syllable.

2. Automatic Test of the Microprogram

Checking the diagnostic unit and its data channels is called automatic testing of the microprogram. Because the microprogram storage has already been checked and it was found to be correct without any error, its automatic test microprogram in it can be used (it can be called the automatic testing program block) to check other parts. This stage involves the use of the surface board switch data to check 19 data channels and 8 function components divided into 20 test regions. The main data channels to be tested are $J_K \rightarrow J_{ZP} \rightarrow J^Q_{YC}$, $J^Q_{YC} \rightarrow J^Q_{YC}$, the various shift channels of J^Q_{YC}, the intersection channel of J^Q_{YC}, $Q_Z \rightarrow J^Q_{YC}$, $Q_Z \rightarrow JS_Z$, $Q_Z \rightarrow JS_{dd}$, $Q_Z \rightarrow J_{ZP}$, $Q_Z \rightarrow J_{dc}$, $J_{dc} \rightarrow J^Q_{YC}$, $K_7 \rightarrow J_{ZHo}$ etc.

To realize automatic transfer of the two steps of longitudinal test stages and the two stages in the course of automatic testing procedure, two signal triggers C_{JZ} and C_{ZbZ} have been set up. The longitudinal testing stage is indicated by $C_{JZ} = 0$. The automatic test of the microprogram is indicated by $C_{JZ} = 1$.

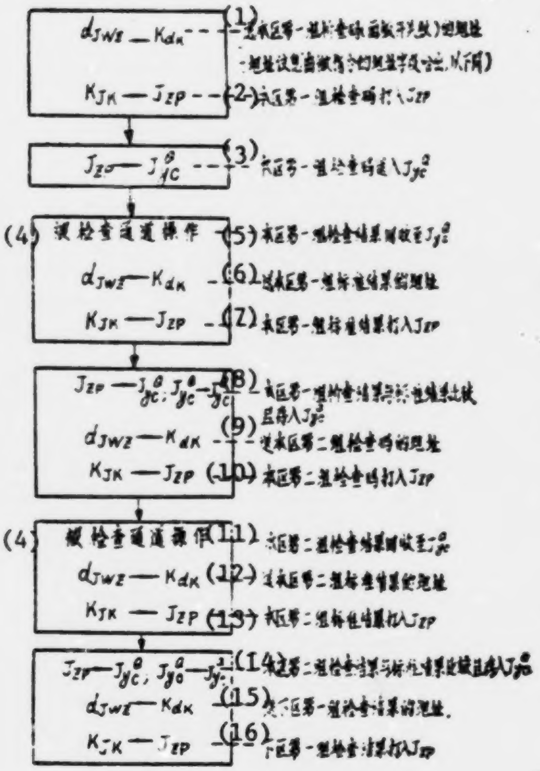
The following is a description of the general structure of the automatic testing of the microprogram. The general form of the channels of automatic testing of the microprogram follows that shown in Flow Chart 1.

Testing the counter is done by taking two as a group each serving as the standard for the other. Its test microprogram is used cyclically. Flow Chart 2 gives the structural form of the automatic checking program of two groups of counters.

By combining the microprograms we can see the thought behind the design: the group of counters JS_{ZHQ} and JS_{sr} with shorter numbers of digits is checked first and then the other group of counters JS_Z and JS_{dd} with longer numbers of digits is checked. After the former is checked, its carry $E_{JS_{ZHQ}}$ and E_{Jssr} are relied upon to make $C^*_{JC} = 1$, and further making $C_{JC} = 1$. In this way, the check transfers to the latter group of counters. After the test, the carry E_{JSZ} or E_{Jsdd} is relied upon to make $C^*_{EJSZ} = 1$ and furthermaking $C_{EJSZ} = 1$. At this point, the cyclic program ends. In addition, the comparison of the status of the counters in the same group is conducted in the modulo 2 plus circuit in the J^Q_{YC}, and the comparative results are stored in J^Q_{YC}. J^Q_{YC} also contains a decide "0" circuit. If the decide "0" circuit is not "0", the machine is shut off, ($Z''0''C_K$), thus indicating the presence of an error.

After the cyclic microprogram ends, it is transferred to the diagnostic program procedure and clears the status device that has been used to "0". To realize this action of supporting the top and opening the bottom, a fixed entry 1 is set up. It accesses the commands in the surface board J_{K7} to J_{ZP}. As described previously, this kind of commands can serve as a command to shut off the machine or as an unconditional transfer command. It then continues to set the diagnostic process signal trigger C_{gZ}. In this way, the process is automatically converted.

Flow Chart 1



Key:

(1) Address of the first set of bridge checking code (number of surface board switches) sent to this region (The address message is given by the address syllable of the microcommand, same in the following)

(2) The checking code of the first group in this region is entered in J_{ZP}

(3) The checking code of the first group in this region is entered in J^{Q}_{yc}

(4) Channel operation being checked

(5) The results of check of the first group in this region is retrieved to J^{Q}_{yc}

(6) Address of standard result of the first group sent to this region

(7) The standard result of the first group in this region is entered into J_{ZP}

(8) The result of bridge check of the first group in this region is compared to the standard result and stored in J^{Q}_{yc}

(9) Address of checking code of the second group sent to this region

(10) The checking code of the second group in this region is entered into J_{ZP}

(11) The result of check of the second group in this region is retrieved to J^{Q}_{yc}

(12) Address of the standard result of the second group in this region

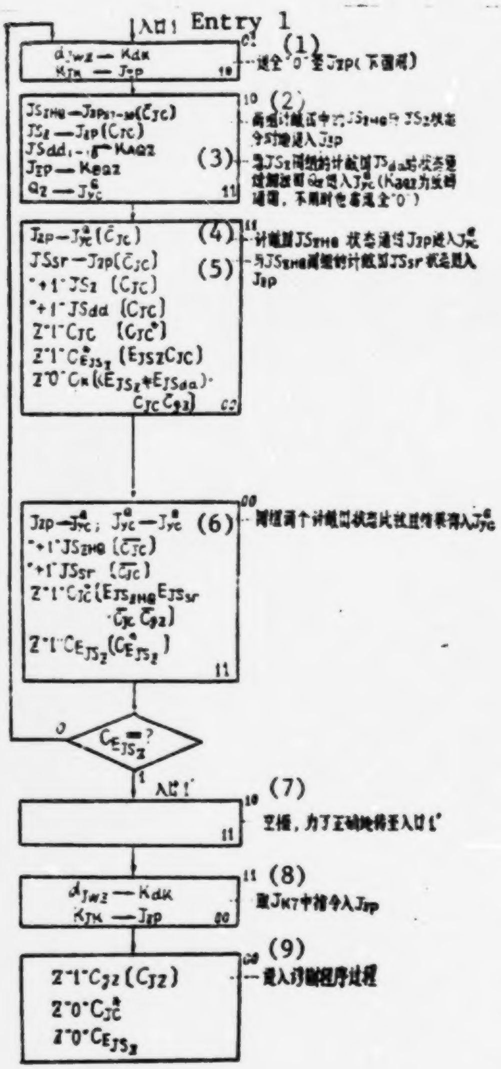
(13) Standard result of the second group in this region is entered into J_{ZP}

(14) Result of check of the second group in this region is compared to the standard result and stored in J^{Q}_{yc}

(15) Address of result of check of the first group sent to the next region

(16) Results of check of the first group of the next region are entered into J_{ZP}

Flow Chart 2



Key:

(1) Send full "0" to J_{ZP} (used below)

(2) The status of JS_{ZHQ} and JS_Z in the two sets of address counters are entered into J_{ZP} on a time shared basis.

(3) The status of JS_{dd} address counter of the same set as JS_Z is entered into J^Q_{yc} via the adder Q_Z (K_{BQZ} is the reverse code channel, when not in use, a full "0" must be transmitted)

(4) The status of JS_{ZHQ} address counter enters J^Q_{yc} via J_{ZP}

(5) The status of JS_{sr} address counter of the same set as JS_{ZHQ} enters J_{ZP}

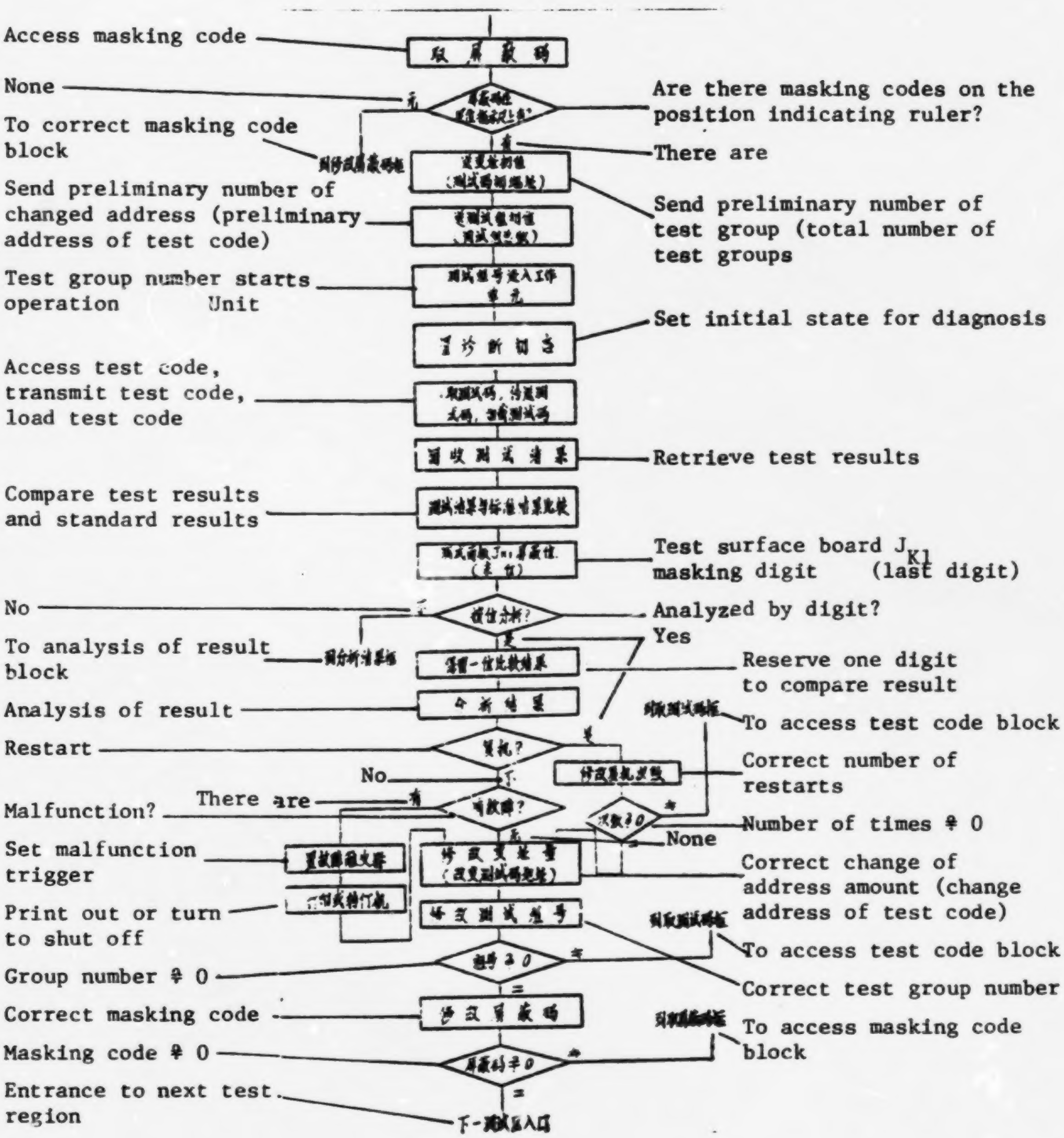
(6) The status of the two address counters of the same set are compared and the results are stored in J^Q_{yc}

(7) Empty block for correctly transferring into entry 1'

(8) Access commands from J_{K7} and enter into J_{ZP}

(9) Enter diagnostic program procedure

(IV) Typical Program Block Diagram


Access masking code
None
Are there masking codes on the position indicating ruler?
To correct masking code block
There are
Send preliminary number of changed address (preliminary address of test code)
Send preliminary number of test group (total number of test groups
Test group number starts operation Unit
Set initial state for diagnosis
Access test code, transmit test code, load test code
Retrieve test results
Compare test results and standard results
Test surface board J_{K1} masking digit (last digit)
No
Analyzed by digit?
Yes
To analysis of result block
Reserve one digit to compare result
Analysis of result
To access test code block
Restart
Correct number of restarts
No
There are
Malfunction?
Number of times ≠ 0
None
Set malfunction trigger
Correct change of address amount (change address of test code)
Print out or turn to shut off
To access test code block
Group number ≠ 0
Correct test group number
Correct masking code
To access masking code block
Masking code ≠ 0
Entrance to next test region

V. Software System

(I) Method of Generating the Test Codes

1. General Description

The nature of testing the logic network is to cause a change in the input variable which will uniquely determine the response at the output end. To realize this goal, the channel must be sensitized. Surrounding the problem of sensitization is a series of methods of test code computations, such as the diagrammatic method, Boolean difference method, D algorithm, channel sensitization method, and fault function method etc. The characteristics of all of these methods are different because the methods of computation of sensitization are different, such as whether only a single fault test group can be found but multiple faults cannot be found; whether a hypothetical fault point must first be assumed; whether only the test group of the composite logic can be found but that of the time series logic cannot be found; whether the best test group numbers of single faults can be found etc. The fault function method has solved these problems. But this method is not yet understood by many people at present, therefore it is necessary to briefly introduce it.

2. Variations of the Logic Function

Using the fault function to find the test group is to obtain it by finding variations in the logic function of the tested network. Let the single level logic function under the forbidden character by $Y = Y(x_1, x_2, \ldots\ldots x_n)$, and let its variable state by $\Delta Y = 1 - Y(x_1, x_2, \ldots\ldots x_n)$. How can this variable state extract the test function? Let us look at the following analysis. From the proof we know that $\Delta Y = Y(x_1 + \Delta x_1, x_2 + \Delta x_2, \ldots\ldots x_n + \Delta x_n) - Y(x_1, x_2, \ldots x_n)$.

Thus the variable state of Y is finding the total differentiation of Y. Concretely, the variable state

$$\Delta Y = \sum_{i=1}^{n} d^i Y,$$

This expansion forms the set of functions $[\Delta Y]_{\bar{Y}}$ shaped like the structure of Y. The assignment of each $[\Delta Y]_Y$ is an AND term of $\bar{Y}$. Between the terms they are related by OR. Each AND term makes $\bar{Y} = 1$, therefore the set of $[\Delta Y]_Y$, i.e., $\sum_{i=1}^{n} d^i Y = \bar{Y}$. It can thus be seen that the assignment of each $[\Delta Y]_Y$ should all make Y take a false value, thus giving a test of the complementary graph $\bar{G}$ of Y. Therefore $[\Delta Y]_Y$ is called the test function of $\bar{G}$ or $\bar{Y}$. If Y takes a true value, then $\bar{Y}$ contains the fault $[\Delta Y]_Y$ fixed at Y. Thus the expansion of the variable state ΔY of Y is the test function of the fault $\bar{Y}$. Similarly, the expansion of the variable state $\Delta\bar{Y}$ of $\bar{Y}$ is the test function of the other type of fault of Y.

It should also be pointed out that ΔY contains the AND terms of i variables of the variable states. Thus Thus the i repeated faults of Y can be detected. When computing the test functions of repeated faults, the original function or the test function already obtained occurs in the expansion of the variable states, it should be eliminated, because it is not a test function. It can be easily proven that

$$\Delta Y = \bar{Y} = \sum_{i=1}^{n} \Delta^{i} Y = d^{n}Y + d^{n-1}Y - Y$$

3. Determination of the Number of Test Functions

(1) The Number of the Best Test Functions

The number of the best test functions of single faults can be obtained. Because the logic network can be described by the logic function, it can also be analyzed graphically and the number of the best test functions can be determined by the graphic method. The number of the best test functions for the logic function of a single level with n variables is $\Lambda + 1 + V + 1 = n + 1$ (where Λ is the number of AND symbols, V is the number of OR symbols, n is the number of input ends used by the components). The number of the best test functions of a multiple level network is $\Sigma\Lambda_i + 1 + \Sigma V_i + 1 = \Sigma(\Lambda_i + V_i + 1) - \Sigma 1 + 2$. The number is the total number of input ends used by the elements plus 1 minus the total number of output ends (Σ 1 represents the total number of output ends).

(2) The Number of Complete Test Functions

Generally, the best test function of single faults is used to diagnose single faults. If multiple faults have to be diagnosed, it will also give a test function. It is a complete test function. Its number is $\bar{Y}(1) + Y(1)$, i.e., adding the values of the two algebraic polynomials obtained by substituting 1 for all the variables in the original function Y and the complementary function $\bar{Y}$ of the single layer logic function. In the channel diagram, it is the total of the number of channels of all the directional branch channels of the original diagram and the complementary diagram and all other directional branch channels connected together once. This is its nature.

The following example is given:

Find the number of diagnostic test functions of

$$Z = x_1 x_2 \ldots x_p + y_1 y_2 \ldots y_q.$$

Solution: The number of input ends used is $n = p + q$. Thus the number of the best diagnostic test functions of single faults is:

$$T'_H = n + 1 = p + q + 1$$

Since $\bar{Z} = (\bar{x}_2 + \bar{x}_2 + \ldots + \bar{x}_p)(\bar{y}_1 + \bar{y}_2 + \ldots + \bar{y}_q)$, the number of the diagnostic test functions of all the faults is:

$$T_H = \bar{Z}(1) + Z(1) = pq + 2$$

4. Method of Finding the Variable States of the Test Function and Locating the Faults

(a) Method of finding the variable states of the function

We know that the logic function can be expressed in the form of the sum of products and it can also be expressed in the form of the product of sums. Here, as used previously, it is assumed that the foregoing is taken as the standard to facilitate the discussion. The complementary diagram of the logic function in the form of the sum of products has a serial structure. The sequence of test functions formed by the greatest AND terms in the ΔY variable states can connect the greatest parallel subdiagrams in the complementary diagram, thus it can test the entire diagram of the complementary diagram. Therefore this sequence of test functions is the test function. The number of this sequence is $\Lambda_M + 1$ (where Λ_M is the greatest number of AND symbols of the greatest AND terms). Under ordinary conditions, the number of test functions does not equal the number of the best test functions. At this time, the test function can only detect faults but cannot locate. For this, a locating test function must be added. Its number is $(\Lambda + 1) - (\Lambda_M + 1)$. The added locating test functions are for partially changing the channels that have already been tested previously to facilitate locating. The actual method is to use a certain AND term of a certain test function to replace the corresponding but different term in other test functions.

It should also be pointed out that as the variables of the greatest AND terms take on variable states, and the variables of the AND terms which are not the greatest have all taken on variable states and there are no more new variable states to be taken on, the variable state of the variable on the extreme right side is taken. The test function thus connects the branch channels on the extreme right side of the serial subdiagram that is not the greatest more than once, i.e., "borrowing channels." In this way, with a test function, a locating function can be generated.

After the test function has been obtained, a test sequence for the assignment of variables can be obtained. The principles of assignment of variables is as follows:

(1) If the test function does not contain complementary variables of variable states, then variables are assigned according to nonvariable states and variable states.

(2) If the test function contains complementary variables of nonvariable states, then the following assignment principles are added:

(i) If $[dY]_Y$ has variables of complementary states, the assignment must be able to point out the problem and should correspond to the problem channel in the complementary diagram, therefore it is not the test function of $\bar{Y}(Y)$ and should be discarded and taken anew.

(ii) If the complementary variables of $[dY]_Y$ are not all variables of variable states, then variables should be assigned according to the variable states. After assignment, the number of variables of variable states of the AND terms in the variables of complementary nonvariable states increases, providing multiple channels to the corresponding subdiagrams in the complementary diagram and forming potential channels.

(iii) If the complementary variables of $[dY]_Y$ are all variables of nonvariable states, then the complementary variables should be individually assigned to transfer the potential channels and isolate the single faults.

The actual logic circuit frequently has multiple levels. Logic networks of multiple levels are represented by multiple order logic functions while high order logic functions are expressed by complex functions. Therefore, differentiation of the complex functions can be used to perform step by step replacement of variables of the functions from output to input and to solve the variable states, thus forming the test functions of each level.

(b) Locating the fault

When the test function $[\Delta Y]_Y$ shaped like the Y structure on the same level is compared to the original function, the state of the variables in the original function is the point of fault. Therefore, the fault function is obtained and is called $[\Delta Y]_Y^*$.

Summarizing the above, fault function diagnostic techniques belong to fault diagnosis. It uses the graphic method to determine the number of the smallest test function and it uses the algebraic method to determine the actual test function and it uses the logical method to determine the faulty part.

(c) An example of application

Diagnose the network described by $Y = x_1x_2x_3 + x_4x_5$

Solution:

$$\overline{Y} = (\bar{x}_1 + \bar{x}_2 + \bar{x}_3)(\bar{x}_4 + \bar{x}_5)$$

$$dY = dx_1x_2x_3 + dx_4x_5 \cdots\cdots ①$$

$$x_1dx_2x_3 + x_4dx_5 \cdots\cdots ②$$

$$x_1x_2dx_3 + x_4dx_5 \cdots\cdots ③$$

$$x_1dx_2x_3 + dx_4x_5 \cdots\cdots ④$$

$$d\overline{Y} = d(\bar{x}_1 + \bar{x}_2 + \bar{x}_3)(\bar{x}_4 + \bar{x}_5) \cdots\cdots ⑤$$

$$(\bar{x}_1 + \bar{x}_2 + \bar{x}_3)\,d(\bar{x}_4 + \bar{x}_5) \cdots\cdots ⑥$$

Equation (4) is obtained by replacing x_4dx_5 of equation (2) by dx_4x_5 of equation (1).

The test and fault functions are shown in the following table:

Test

$(dY)_Y$	测	试					$(\Delta Y)^*_Y$
$(d\bar{Y})_{\bar{Y}}$	x_1	x_2	x_3	x_4	x_5	Y	$(\Delta\bar{Y})^*_{\bar{Y}}$
①	0	1	1	0	1	0	$Y^1 = x^1_1 + x^1_4$
②	1	0	1	1	0	0	$Y^1 = x^1_2 + x^1_5$
③	1	1	0	1	0	0	$Y^1 = x^1_3 + x^1_5$
④	1	0	1	0	1	0	$Y = x^1_2 + x^1_4$
⑤	1	1	1	0	0	1	$Y^0 = x^0_1 + x^0_2$
⑥	0	0	0	1	1	1	$Y_0 = x^0_4 + x^0_5$

(II) Special Diagnostic Commands

This machine has 25 diagnostic commands shown in detail in Appendix 2. Here, the meaning of only a few special diagnostic commands is explained.

1. Installed Microcommand W_1

(1) FORM

CM_8	$Empty_3$	B_1	d_{20}

(2) MEANING

1) $(D) \Longrightarrow J_{wy}65\sim96$
2) $(D+4) \Longrightarrow J_{wy}33\sim64$
3) $(D+4) \Longrightarrow J_{wy}1\sim32$

(3) USE To prepare the test code the operational control microcommand register J_{wy} has to be equipped with an encoder for microaction signals and only one beat is used. It is used in combination with the loaded test code command CS.

2. Loaded Test Code CS

(1) FORM

CM_8	CB_3	B_1	d_{20}

(2) MEANING

1) $(D) \Longrightarrow J_{zp}$
2) $CB_i \Longrightarrow C_{cs}$

3) Z"0"C_Z (the diagnostic function clock is turned off and the operational control function clock is turned on).
4) Z"0"C_{ZY} turns on the output of the operational control decoder.

(3) USE To access the test code for the part to be tested and to place it in J_{ZP}, its previous command is W_1. In this way, the test code is loaded onto the tested parts with a length of 32 digits or 64 digits.

3. Installed Microcommand W_2

(1) FORM

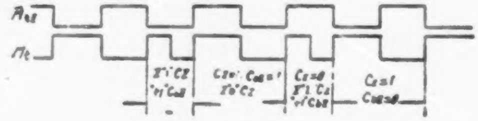
CM_8	CB_3	B_1	d_{20}

(2) MEANING

1) $(D) \Longrightarrow J_{WY}65\sim96$
2) $(D+4) \Longrightarrow J_{WY}33\sim64$
3) $(D+8) \Longrightarrow J_{WY}1\sim32$
4) $CB_1 \Longrightarrow C_{ed1}$ $CB_2 \Longrightarrow C_{pz}$
5) Z"0"C_Z (turns off the diagnostic function clock and turns on the operational control function clock)
6) Z"0"C_{ZY} (turns on the output of the operational control decoder).

(3) USE To let the test code go through the old test region or to retrieve the test results to J^{Q}_{yc}, the J_{wy} requires an installation of an encoder for signals of microaction, and one beat or two beats can be used (decided by CB_2).

When executing the CS and W_2 commands, there is a problem of shutting off the diagnostic function clock and turning on the operational control function clock. This is because the diagnostic function cycle is two times the normal cycle of operational control functions (avoiding a shortage of the diagnostic logic levels), but during the test, the original clock cycle of operational control must be used (to truly test the fault caused by a shortage of the logic level). Here a problem concerning transformation of the clock cycles exists. Also, a problem concerning the selection of the polarity of the clock exists. These are explained in the following diagram.



Selection of polarity of the wave forms

The relative position of the wave forms shows that the following logical relationship is satisfied:

$$\bar{M}_t = M_{ty}\bar{C}_Z + M_{tZ}C_Z\bar{C}_{bZ} + \bar{M}_{tZ}C_ZC_{bZ}$$

Of these, $C_Z = 0$ indicates a state of operational control function; $C_Z = 1$ indicates a state of diagnostic function; M_{ty} is the operational control function clock; M_{tZ} is the diagnostic function clock; C_{bZ} is the control trigger for the selection of wave forms, M_t is the combined function clock.

4. Test Results of Retrieval

(1) FORM

CM_8	$Empty_3$	B_1	d_{20}

(2) MEANING $\overline{(D_{13}\cdots\cdots D_{18})} \Longrightarrow J^{Q}_{yc}$

(3) USE The retrieval points are the tested units that are unrelated to the bus switch, such as J^{H}_{yc}, $J_{WY}1 - 32$, $J_{WY}33 - 64$, J_{WY} 65 - 96, YM_{WY} and spare parts.

5. Analysis of the results FX

(1) FORM

CM_8	$Empty_3$	B_1	d_{20}

(2) MEANING
1) If $(J^{Q}_{yc}) \neq 0$, Z"1"C_{yg} and $K_{CT} = 1$, the machine is turned off;
2) If $K_{XH} = 1$, then turn to D;
3) If $K_{XH} = 0$ and $(J^{Q}_{yc}) \neq 0$ and $K_{CT} = 0$, then execution is in order;
4) If $K_{XH} = 0$ and $(J^{Q}_{yc}) = 0$, then jump one access command.

(3) USE Used for analyzing the results, the decide "0" results of J^{Q}_{yc} and the states K_{CT} and K_{XH} are combined, giving four directions of operation.

(III) Mode of Programmed Operation

Command access and data access are serial operational modes. The diagnostic program transfers the program from the data tape to the internal memory by the input command. Then it is placed at program entry and execution of the program begins. The commands go from the internal memory to J_{ZP} via the K_7 switch of the memory control. Data also go to J_{ZP} via the K_7 switch and then are stored in J^{Q}_{yc}. Operation then begins. This is the mode of operation. Input and execution of the program are carried out entirely under the control of the diagnostic microprogram.

VI. Function of the Diagnostic System

A complete diagnostic machine must have three functions: first used as a debugging tool, then used as a monitoring tool during testing and afterwards used as a maintenance tool. This system does not possess the second function. Only the special diagnostic machine in large computers has such a function. They can discover errors in time via a complete checking system and report the error to the diagnostic machine. The diagnostic machine can start the diagnostic subroutine of the corresponding part based on the code of the checking signal (like interrupt registration) to carry out diagnosis. If there are support units, the faulty units can first be replaced and then diagnosed off line. If there are no support units, the field must be protected first and then diagnosis can be performed. After the malfunction has been eliminated, the field is restored.

This system only possesses the first and third functions.

(I) Debugging Function

Because the hardware core unit is a part of the command control unit, it can only perform the function of debugging the operational control unit and debugging command control unit. After one part in the main memory is debugged and under the prerequisite that the joint debugging of the memory control and the main memory has been completed, the diagnostic program can be used to debug the operational control unit. This is exactly the same as diagnosis during the maintenance stage. Technical faults can be detected such as broken (missing) lines, multiple (wrong) lines, welding of wrong places and missing places that should have been welded. Malfunctioning of components and faults in logic can also be detected. If location test codes are more finely tuned, accurate locating is possible.

Inserted units can be used for debugging and can also be used to debug this machine in a snowball fashion. The inserted unit is inserted into one's own position and the diagnostic program is then connected to it. This is all that is required.

Debugging is done in two steps because the method of computing the test codes are different. The first step is the fault debugging stage. The test code is theoretically obtained according to the method of computation. The second step is the stage of checking the function. At this time, the test codes are the same as the function checking codes. They are used to check errors in the method of computation, accuracy, command functions and logic design. The efficiency of locating in this step is not as good as the previous step and human intervention is needed.

According to this debugging order, the operational control unit does not need to have separate debugging equipment. If there is an independent diagnostic machine the debugging function will not be limited by the order of debugging.

(II) Maintenance Function

When the machine malfunctions, it is shut off. When the machine is turned on and the system is diagnosed, the malfunction can be quickly located on 1 to 2 inserted units. Supporting inserted units can replace the faulty ones and the machine can continue to operate. Thus, a highly efficient maintenance tool is an important means to increase the machine's usability rate and reliability.

VII. Function and Characteristics of the Diagnostic System

(I) Function

1. Area Covered

The percentage of diagnosis of operational control is 100 percent in principle. But actually because of the lack of connection between some spare units and the bus switch, or because of too many turn abouts, it is not convenient to sweep in or retrieve, the actual diagnostic percentage is over 95 percent. The diagnostic percentage of the main frame is about 80 percent, because the memory control has its own means of automatic testing and the memory control and main memory have a means for joint debugging. The main function units of the command control unit can serve as the hardware core for diagnosis and thus undergo automatic testing. The important accumulator register of the command control unit can also be diagnosed. The operational control unit is almost entirely diagnosed and these occupy most of the equipment of the mainframe.

2. Locating Efficiency

It is closely related to the method of computation of the test codes. The efficiency of locating the fault using the "fault function method" to locate the fault locating code is very high, because it is actually a microchannel diagnosis. Therefore it can locate the fault fixed at "0" or at "1" in each component. The use of function checking codes to locate the faults is in principle not as effective as the former but the efficiency of locating faults of this type of checking codes is closely related to the structure of the machine. If the structure is rational, a very good locating efficiency can be achieved. If a function code is used to test the read only memory of the operational control unit, then the fault locating can be accurate to within a medium scale component.

For this machine, when necessary, diagnosis can locate a fault to within an inserted unit, in very few cases the faults can be located within two inserted units. Function test locating can locate faults within a component.

3. The Number of Test Regions

This machine has about 50 test regions.

4. Efficiency of Test Codes

The number of test groups for faults detected and located by the "fault function method" is the best and they are not repetitive. It can detect and locate single faults and can also detect and locate multiple faults. Therefore that test code has a higher efficiency. Function test codes also have a better locating efficiency under definite conditions but because more test groups are needed, the test efficiency is not as good as the former.

5. Types of Detected Faults

This machine can detect fixed faults and can also detect intermittent faults. This is realized mainly by repeated testing. A special row of switches is set up on the surface board. Eight of the digits are used to establish the number of repeated tests. In addition, errors due to malfunction can be detected and functional errors can also be detected. Because the use of diagnostic commands can debug or can be used to install the operational control microprograms of any part, this is the same as diagnosing ROM_Y.

6. Truthfulness of Diagnosis

Because a diagnostic retrieval switch has been set up, the logic levels have been increased, thus the diagnostic cycle has increased to two times the operational control function cycle. Diagnostic truthfulness can only be possible in this way. In this way, the faults caused by a shortage of the logic levels of operational control can be discovered. For this, a function cycle transfer and selection and control of the polarity of wave forms are set up.

7. Amount of Diagnostic Equipment

Because the command control function unit is shared, the number of special diagnostic units is reduced. Only 20 inserted units (mostly standard units, there are only two nonstandardized diagnostic units). The operational control unit has 200 inserted units (the inserted units of the accumulator register being diagnosed are not included, they belong to the command control unit). Thus the amount of diagnostic equipment constitutes 10 percent. If there are more nonstandardized inserted units for more types of diagnosis and when diagnosis of parts of nonoperational control units are counted, the percentage is even lower. This is already within the limits of the international statistical standard of 25 percent.

(II) Characteristics

1. Diagnosis of this system is microdiagnosis. It is a diagnosis of microchannels through the implementation of microcommands.

2. This diagnostic system is actually a hidden diagnostic machine. Because it uses the command control unit as the hardware core, and it also uses memory control and main control, therefore it is not an independent machine, but there is a set of software systems and hardware systems (even some are used in combination) that possesses all diagnostic functions, thus it is a small diagnostic machine contained within the mainframe.

3. The software has a diagnostic command system. It is more versatile than the diagnostic program block.

4. Automatic testing is automatically converted to diagnosis and diagnosis must first undergo autotesting. This is a measure to assure reliability and dependability.

. Transfer of diagnostic program can be carried out in a versatile manner by switches. The row of switches on the surface board has 24 digits for such use.

6. The number of test regions and the number of groups of test regions are comprehensively considered, because the number of test regions is not only related to the number of logic function blocks but also is related to the number of test groups. If the test region is too large, the number of test groups increases. If the test region is too small, the number of test groups is reduced, and the number of test regions is increased, therefore they must be uniformly considered to achieve a faster diagnostic speed.

7. Special consideration has been given to shorten the word length of the microcommands and the correct selection of the parts.

8. The diagnostic system and the system being diagnosed are well coordinated. Here, microdiagnosis is matched with the operational control unit's microprogram so that the microaction signals for operational control needed in the test are easily accessed. The operational control unit has an uncontrolled microcommand decoder, otherwise the diagnosis must drop the various control conditions on side channels, the microcommand register has specially added some microaction signals for diagnosis to facilitate retrieval or testing, such as the addition of the signal of the test accumulator register J_L; the main register operational control and the bus are connected by a double channel structure (far and near) to facilitate retrieval.

9. The design of the diagnostic system takes into consideration the entire situation of the processor and combines hardware and software. For example, the "fault function method" regards the clock M_t as a variable when diagnosing the time sequence logic. Thus a logic to control the clock M_t is added to the hardware to assure normal operational time is counted by M_t and a test code can be added for the time of diagnosis. Diagnosis of spare parts uses hardware with a retrieval switch and added software combined with the use of masking techniques. Because spare parts are not directly connected to the bus, a retrieval channel is added to retrieve those parts that are truly not easy to retrieve. All retrievable parts are all retrieved and compared using the locating indicator ruler's masking function. Using the function test code to test the operational control unit's microprogram storage has achieved a better locating effect. This is also an actual example of combining software and hardware.

VIII. Concluding Remark

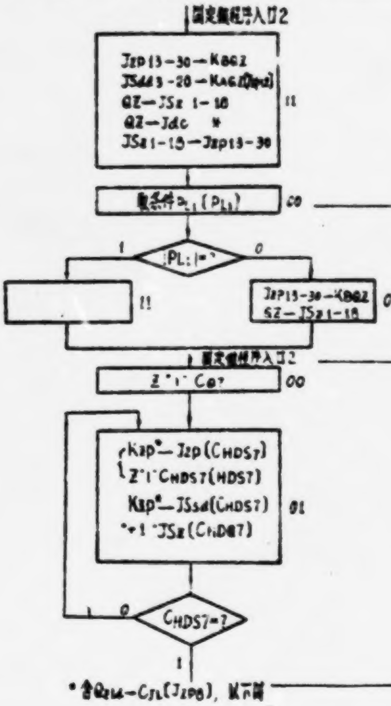
The establishment of this diagnostic system for the diagnosis of digital computers is a preliminary attempt.

Because the hardware core shares the command control unit, the net increase of equipment is very small, the cost is low, and practice proves that the system has a practical value in the diagnosis of medium and small computers.

Appendix I

1. 非“0”转移丰：

Non- "0" transfer 丰:



固定微程序入口2
JZP13-30—KBGZ
JSΔG3-20—KAGZ(JZPZ)
QZ—JSZ 1-18
QZ—Jdc *
JSZ1-18—JZP13-30
11
取条件PL1(PL1)
00
|PL1|=?
1
0
11
JZP13-30—KBGZ
QZ—JSZ1-18
01
固定微程序入口2
Z"1"CGZ
00
Kzp*—Jzp(CHDS7)
Z"1"CHDS7(HDS7)
Kzp*—JSsd(CHDS7)
"+1"JSZ(CHDS7)
01
CHDS7=?
0
1
*含QZ14—CJL(JZP8), 见下面

Fixed microprogram entry 2

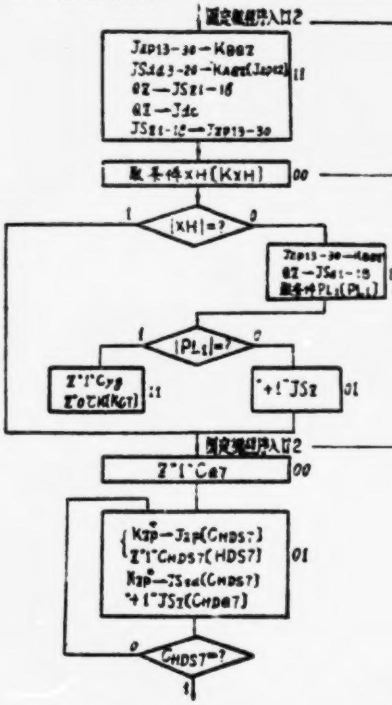
Access condition P_{L1} (P_{L1})

Fixed microprogram entry 2

Contain Q_{Z14} $C_{JL}(J_{ZP8})$

2. 分析结果 FX：

Result of Analysis FX:



固定微程序入口2
JZP13-30—KBGZ
JSΔG3-20—KAGZ(JZPZ)
QZ—JSZ1-18
QZ—Jdc
JSZ1-18—JZP13-30
11
取条件XH(KXH)
00
|XH|=?
1
0
JZP13-30—KBGZ
QZ—JSZ1-18
取条件PL1(PL1)
10
|PL1|=?
1
0
Z"1"CYG
Z"0"CKG(KGT)
11
"+1"JSZ
01
固定微程序入口2
Z"1"CGZ
00
Kzp*—Jzp(CHDS7)
Z"1"CHDS7(HDS7)
Kzp*—JSsd(CHDS7)
"+1"JSZ(CHDS7)
01
CHDS7=?
0
1

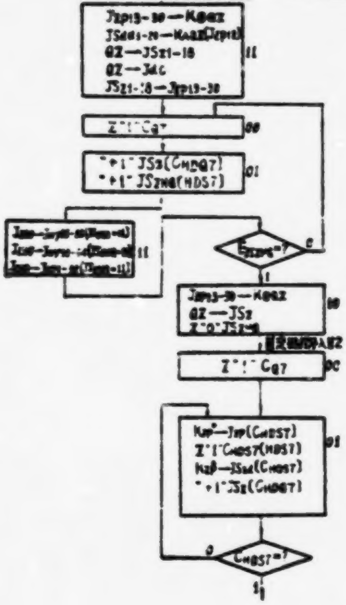
Fixed microprogram entry 2

Access condition XH (KXH)

Access condition PL_1 (PL_1)

Fixed microprogram entry 2

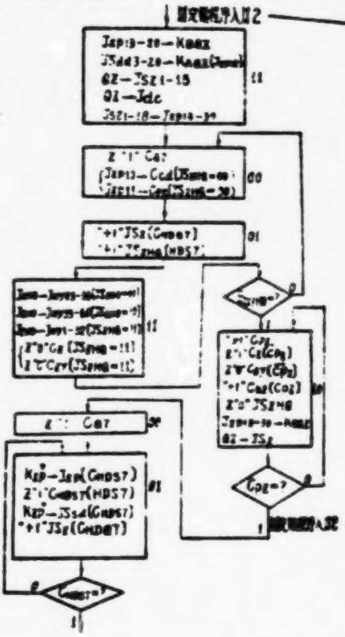
3. 装配微指令 W_1: ——— Installed Microcommand W_1:


固定微程序入口2
11
00
01
11
0
1
00
固定微程序入口2
0C
01
0
1

Fixed microprogram entry 2

Fixed microprogram entry 2

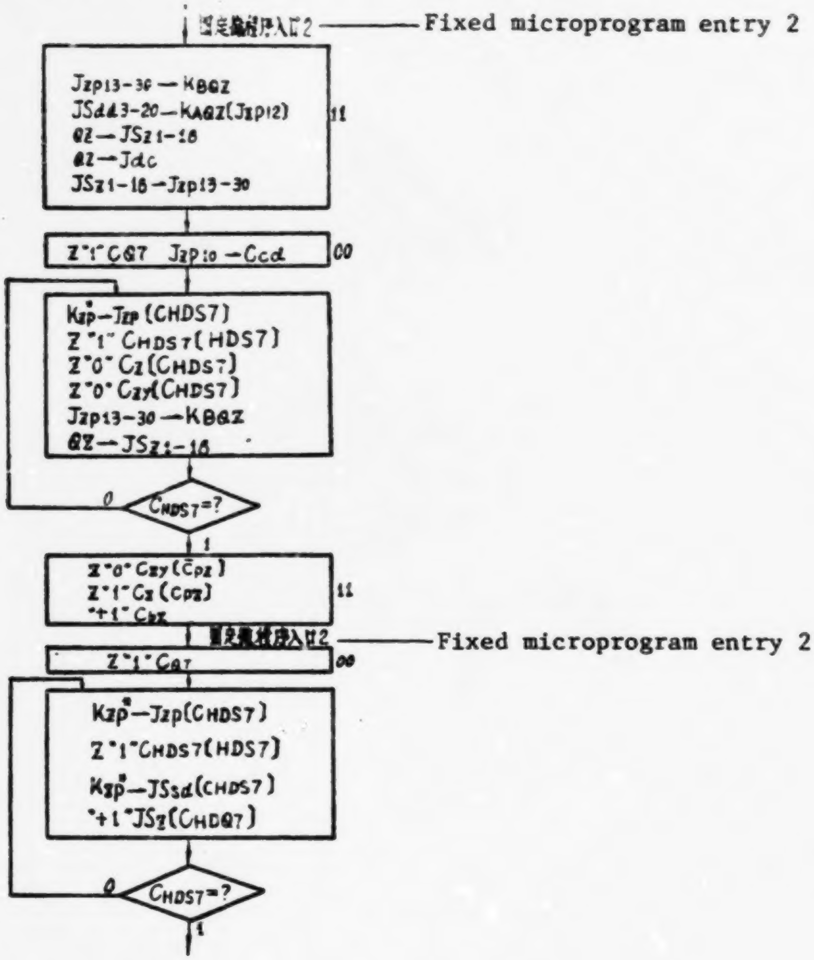
4. 装配微指令 W_2: ——— Installed Micrommand W_2:


固定微程序入口2
11
00
01
11
01
固定微程序入口2
0
1

Fixed microprogram entry 2

Fixed microprogram entry 2

5. 加载测试码 CS： ——Load Test Code CS:


固定微程序入口2
Fixed microprogram entry 2
Jzp13-30 — KBQZ
JSdd3-20 — KAQZ(Jzp12)
QZ — JSz1-16
QZ — Jdc
JSz1-16 — Jzp13-30
11
Z"1" CQ7 Jzp10 — Ccd
00
Kzp — Jzp (CHDS7)
Z "1" CHDS7 (HDS7)
Z"0" Cz (CHDS7)
Z"0" Czy (CHDS7)
Jzp13-30 — KBQZ
QZ — JSz1-16
0
CHDS7=?
1
Z"0" Czy (Cpz)
Z"1" Cz (Cpz)
"+1" Cpz
11
固定微程序入口2
Fixed microprogram entry 2
Z"1" CQ7
00
Kzp — Jzp(CHDS7)
Z"1"CHDS7(HDS7)
Kzp — JSsd(CHDS7)
"+1"JSz(CHDQ7)
0
CHDS7=?
1

Appendix II Diagnostic Commands System

1. Type:

The diagnostic commands system can be divided into the following types according to the modes of operation:

(1) Memory reference
(2) Test of general purpose adder (J_L)
(3) Retrieval
(4) Shift
(5) Other

2. Command Format:

8	3	1	20
CM	CB	B	d

Where CM--operational code of 8 digits
d--relative address 20 digits
B--address change indicator digit 1 digit

$$\text{Reference address } D = \begin{cases} d & [B = 0] \\ d + (JS_{dd}) & [B = 1] \end{cases}$$

d,	1	2	3	…………	17	18	19	20
+) JS_{dd}	1	2	3	…………	17	18		
$D = d + (JS_{dd})$	1	2	3	…………	17	18	19	20

i.e.: The high 18 digits and the 18 digits of JS_{dd} are lined up and added to obtain high 18 digits, the last 2 digits of D, D_{19} D_{20} are the same as d_{19} d_{20}.

D is written as D_1 D_2 D_3...........D_{17} D_{18} D_{19} D_{20}

In memory reference type commands, the high 18 digits of D are D_1 D_2 .....D_{18}, representing the address in the main memory, the remaining are not defined.

In the test J_L type command, the D_{14} D_{15} D_{16} D_{17} D_{18} of D represent different channels and different J_L, the rest are not defined.

In the retrieval type command, D_{15} ......D_{18} of D represent the coded address of the retrieved parts (test region), the remaining are not defined.

In shift type commands, D_{17} D_{18} of D respectively represent the direction of shift and the number of shifts, the remaining are not defined.

In other types of commands, D is not defined.

--CB--operational code indicator digit, a total of three digits, separately called CB_1 CB_2 CB_3 , which are only meaningful in W_2, CS, + CB.
--OB has the following meaning in W_2 and CS commands:
--CB_1--long and short operation indicator digit;
--CB_2--single/double beat operation indicator digit;
--CB_3--side route indicator digit.

In the +CB commands, its meaning represents constants 0-7.

3. Operational Modes of the Commands:

The commands are of single address forms, under general conditions, the first operational number is in J^Q_{yc}, thus, the basic form of operation of the commands is:

$$(J^Q_{YC})CM(D) => J^Q_{YC}$$

4. Form and meaning of each type of commands:

1. Memory reference type

(1) Access the operational number from the main memory ↓

Form:

8	3	1	20
↓	empty	B	d

Meaning: $(D) => J^Q_{YC}$

(2) Input numbers into main memory ↑

Form:

8	e	1	20
↑	empty	B	d

Meaning: $(J^Q_{YC}) => D$

(3) Logic multiplication

(1) 形式：

8	3	1	20
∧	3空	B	d

(2) 意义： $(J^{Q}_{YC})\wedge(D)\Rightarrow J^{Q}_{YC}$

(4)〈4〉 模二加⊕

(1) 形式：

8	3	1	20
⊕	3空	B	d

(2) 意义： $(J^{Q}_{YC})\oplus(D)\Rightarrow J^{Q}_{YC}$

(5)〈5〉 无条件转移 ↱

(1) 形式：

8	3	1	20
↱	3空	B	d

(2) 意义：(6)转向D取指令

(7)〈6〉 转子

(1) 形式：

8	3	1	20
$\overrightarrow{\text{子}}$ (8)	3空	B	d

(2) 意义：(9)下一条指令地址 $(JS_Z)+4\Rightarrow D$

(10)转向D+4 取指令

(11)〈7〉 非零转移≢

(1) 形式：

8	3	1	20
≢	3空	B	d

(2) 意义：(12)当 $(J^{Q}_{YC})\neq 0$ 时转向D取指令

(13)当 $(J^{Q}_{YC})=0$ 时，顺序取指令

〈8〉 传送B，B↓
(14)

(1) 形式：

8	3	1	20
B↓	3空	B	d

(2) 意义：(D)(15)左端18位 $(D)_{1,2\cdots\cdots 18}\Rightarrow JS_{dd}$

(16)〈9〉 测试 B1，≠B1

(1) 形式：

8	3	1	20
≠B1	3空	B	d

(2) 意义：① $(JS_{dd})+1\Rightarrow JS_{dd}$

(17)②当 $(JS_{dd})\neq 0$ 时转向D取指令

(18)当 $(JS_{dd})=0$ 时顺序取指令

(19)〈10〉测试 B2，≠B2

(1) 形式：

8	3	1	20
≠B2	3空	R	d

(2) 意义：① $(JS_{dd})+(D)\Rightarrow JS_{dd}$

(20)②当 $(JS_{dd})\neq 0$ 时顺序取指令

(21)当 $(JS_{dd})=0$ 时跳一条取指令

(22)〈11〉保存B，B↑

(1) 形式

8	3	1	20
B↑	3空	B	d

(2) 意义：$(JS_{dd})\Rightarrow(D)_{1,2\cdots\cdots 18}$ 其余位清零(23)

(24)〈12〉加D指令 + D

(1) 形式

8	3	1	20
+D	3空	B	d

Key:

(1) Form: (3) Empty

(2) Meaning:

(4) Modulo 2 plus ⊕

(5) Unconditional transfer ↱

(6) Transfer to D to access commands

(7) Rotor

(8) Rotor

(9) Address of the next command

(10) Transfer to D + 4 to access commands

(11) Non-zero transfer ≢

(12) When $(J^{Q}_{YC})\neq 0$, transfer to D to access command

(13) When $(J^{Q}_{YC})=0$, access commands in order

(14) Transmit

(15) The first 18 digits of

(16) Test B1, ≠B1

(17) When $(JS_{dd})\neq 0$, transfer to D to access commands

(18) When $(JS_{dd})=0$, access commands in order

(19) Test B2, ≠B2

(20) When $(JS_{dd})\neq 0$, access commands in order

(21) When $(JS_{dd})=0$, jump one to access commands

(22) Retain B, B↑

(23) 18 the remaining cleared to zero

(24) Add D command +D

意义：(2) $(J^{Q}_{YC})_{18\sim 38}$ 位 (3) + $(D)_{1,2\cdots 18}$ 位 (3) $\Rightarrow J^{Q}_{YC}$

进位丢掉 (4)

〈13〉加 CB 指令 +CB (5)

(1)形式：

8	3	1	20
+CL	CB	B	d

(2)意义：$(D)16\sim18$ 位 (3) $+CB \Rightarrow J^{Q}_{YC} \Rightarrow D$，其余位清零。(6)

〈14〉装配微指令 W_1 (7)

(1)形式

8	3	1	20
W_1	18空	B	d

(2)意义：$(D) \Rightarrow J_{WY65\sim96}$

$(D+4) \Rightarrow J_{WY33\sim64}$

$(D+8) \Rightarrow J_{WY1\sim32}$

〈15〉装配微指令 W_2 (8)

(1)形式

8	3	1	20
W_2	CB	B	d

(2)意义：①同 W_1 (9)

②$CB_1 \to C_{cd}$（C_{cd} 长短指令标志触发器）(10)

$CB_2 \to C_{PZ}$（C_{PZ} 单/双拍标志触发器）(11)

$CB_3 \to C_{PL}$（C_{PL} 旁路标志触发器）(12)

③Z"0"C_Z（关闭诊断工作周期，开放运控工作周期）(13)

〈16〉加载测试码 CS (14)

(1)形式

8	3	1	20
CS	CB	B	d

(2)意义：①$(D) \Rightarrow J_{ZP}$

②同 $W_2$② (15)

③同 $W_2$③ (16)

〈17〉分析结果 FX (17)

(1)形式

8	3	1	20
FX	18空	B	d

(2)意义：(19) ①若K循＝1　则转向D取指令

(20) ②若K循＝0，　当 $(J^{Q}_{YC}) \neq 0$ 且 K故停＝1 时，

(22) Z"1"C_{yg} 且停机

(23) 当 $(J^{Q}_{YC}) \neq 0$ 且K故停＝0 时顺序取指令

(24) 当 $(J^{Q}_{YC}) = 0$，跳一条取指令

〈18〉回收指令HS (25)

(1)形式：

8	3	1	20
HS	18空	B	d

(2)意义：$(D_{13\sim18}) \Rightarrow J^{Q}_{YC}$

〈19〉移位指令 ⇄ (26)

(1)形式

8	3	1	20
⇄	18空	B	d

(2)意义：$\overset{\xleftarrow{1}}{(J^{Q}_{YC})} \Rightarrow J^{Q}_{YC}(D_{17}D_{18}=00)$

Key: (1) Form:

(2) Meaning: (3) digits

(4) Carry delete

(5) Add CB command +CB

(6) the remaining cleared to zero

(7) Installed Microcommand W_1

(8) Installed Microcommand W_2

(9) ① is same as W_1

(10) is long and short command indicator trigger)

(11) is single/double beat indicator trigger)

(12) is side route indicator trigger)

(13) (close diagnostic work cycle, open up operational control work cycle)

(14) Load test code CS

(15) ② Same as W_2 ②

(16) ③ Same as W_2 ③

(17) Result of Analysis FX

(18) Empty

(19) ① if K cycle = 1, then transfer to D to access commands

(20) ② if K cycle = 0, when $(J^{Q}_{YC}) \neq 0$ and K malfunctions = 1 hour,

(22) $Z''1''C_{yg}$ and machine is shut off

(23) When $(J^{Q}_{YC}) \neq 0$ and K malfunctions = 0, access commands in order

(24) When $(J^{Q}_{YC}) = 0$, jump one to access commands

(25) Retrieval command HS

(26) Shift command ⇄

$\overleftarrow{(J^{Q}_{YC})}^{1} \Rightarrow J^{Q}_{YC}$ $(D_{17}D_{18}=01)$

$\overleftarrow{(J^{Q}_{YC})}^{4} \Rightarrow J^{Q}_{YC}$ $(D_{17}D_{18}=10)$

$\overleftarrow{(J^{Q}_{YC})}^{8} \Rightarrow J^{QC}_{Y}$ $(D_{17}D_{18}=11)$

(3) 〈20〉测试通用累加器 J_L

(1) 形式

8	3	1	20
CJ	4 空	B	d

(2) 意义：$D_{14}=\begin{cases}0 & J_L \text{ 内容经} L_i \text{通道出/入} (5)\\ 1 & J_L \text{ 内容经} L_j \text{通道出/入} (6)\end{cases}$

$D_{15}D_{16}D_{17}D_{18}$ 分别表示16个不同累加器地址。(7)

(8)〈21〉停机指令 TJ

(1) 形式 TJ

(2) 意义：Z"0" C_K

〈22〉光电输入 SR (9)

〈23〉窄行打印输出 (10)

〈24〉置初值 (11)

(1) 形式 Z0

(2) 意义：Z"0"C_{YE}

〈25〉返回自检初态 (12)

(1) 形式 ZZ0

(2) 意义：ZZ"0"

Key:

(1) Form:

(2) Meaning:

(3) General purpose adder J_L for test

(4) Empty

(5) content exits/enters via Li channels

(6) content exits/enters via Lj channels

(7) respectively represent the addresses of 16 different adders

(8) Shut off command TJ

(9) Photoelectric input SR

(10) Narrow line printer output

(11) Set initial value

(12) Return to autotest initial state

9296
CSO: 8111/0224

APPLIED SCIENCES

303-1 GENERAL WAGE PROGRAM INTRODUCED

Beijing DIANZI KEXUE JISHU [ELECTRONICS SCIENCE AND TECHNOLOGY] in Chinese No 4, 4 Oct 80 pp 15-16

[Article by Chen Shengdong [7115 5116 2639]: "An Application Software of the DJS100 Series Computer; Brief Introduction to the Function of the '303-1 General Wage Program'"]

[Text] Using the computer to compute wages has already been practiced in our nation. The ordinary computational programs are mostly written in ALGOL, COBOL and BASIC, which are high level languages. Using high level languages to write programs has its advantages but it also brings about some problems. For example, data input is mostly in the form of source tapes and during the input process, mistakes can easily be made, and the procedures of operation are also more complex. More importantly, programs written in high level languages frequently can only be used on large machines, or require larger internal storage, therefore are not easily popularized on small machines. According to the present situation in our nation, it is necessary to design more applications programs suitable for small machines, and to expand the scope of application.

The "303-1 general wage program" is a wage computation program for use on small computers. The program is written in assembly language. When used in the DJS-130 machine, it takes up 2K of internal memory, and including data regions and operational elements, any DJS1--series machine with over 4K of internal memory--can use that program.

In the process of designing the program, the emphasis has always been on "general purpose," therefore that program is highly versatile and general. During the design, the 14 output formats were designed in reference to the wage forms used domestically and the actual situation of the output equipment of the 100 series machines. These include: H -- work number (work card number or code number); G -- basic wage; J -- added wage (or activity wage); X -- cleaning costs (or social benefits costs); E -- transportation costs (or other income); Z -- total income; F -- room fee; B -- nursery fee (child care fee); C -- meal tickets; N -- heating fee; Y -- medical costs; K -- deductions (sick and business leave); Q -- other expenses; S -- net salary.

The letters listed above are the first letters of the pinyin of Chinese characters of the various wage parameters. They not only serve as the names of the parameters but also the commands of input of those parameters.

Actually, each wage parameter constitutes one row in the parametric matrix. The program requires the user to assign a numerical order to each item to be computed as the pointer of the line of the parametric matrix (or called internal codes), and the command A is used to represent it. The program realizes the input of any wage parameter of all items to be computed. For example, a person Jia is assigned as internal code 012, his basic wage is 62 yuan, his activity wage is 6.5 yuan, medical cost is 1.5 yuan, telephone cost is 2.3 yuan, then, the input string of commands is:

```
A12*G6200* J650*Y150* 0230
```

Here, the parametric values are based on the monetary unit "fen" of the Renminbi, "*" is the sign to separate the numbers. Input of the string of commands can be teletype input and photoelectric input.

Consideration has been given to the fact that the wage forms of each unit contain some relatively fixed items and several variable items. To improve the efficiency of the computer, the program requires the user to record the fixed items on paper tape (also called the fixed tape) for the computer. The number of fixed items can be decided by the user. The program requires the user to dial in the exact number of items into the 01 unit. The fixed tape can be of two tapes--tape A and tape B.

The type A fixed tape is a group of numbers headed by the command R. Each number in each group of numbers represents one wage parameter and the numbers are separated by the separation symbol "*". The program processes the command R taking N items as a group (i.e., content of the 01 unit -- number of fixed items), and storing the data in order into the parametric matrix. Thus, for a user with N = 8,,

```
R701*5500*300*160*0*0*350*356*702*6200*300*160*250*0*456*124*
```

equivalent to:

```
A0*H701*G5500*J300*X160*E0*F350*B356

A1*H702*G6200*J300*X160*E250*F456*B124*
```

Here it must be pointed out that:1) the total income (Z) is computed by the program from the previous items of income. At the time of input, it serves only as a format parameter, and it can be replaced by any numerical value, but like other zero value terms, it must occupy the space of one term; and 2) R commands are stored in order beginning with the number zero in the order numericals. Thus on the fixed tape, it is not necessary for any other commands to appear. The A type paper tape, whether it is a fixed tape or a variable tape (a paper tape that includes strings of commands of variable items), can use both the 5-unit and the 8-unit formats.

The program provides the function of manual inspection of mistakes for the A type paper tape input. The program can affect the demands of the user by making all messages contained on the paper tape to reappear.

The B type fixed tape is a special binary purpose format paper tape punched out according to the keypunch commands (ZB) of this program. Input of binary fixed tape is executed by a special command (W). At this time, the machine itself inspects the mistakes.

Because of the different management systems of each department at present, the "303-1 general purpose wage program" has selected a more general purpose management form to realize the wage computations of a three level management system. The program takes the shift group (a maximum of 64 persons) as the basic unit for computation. Computation includes the net pay of each individual, the analysis of the number of bills of different denominations, and computations of subtotals of each small group. After computations for a small group have been completed, the total command (P) can be used to total all the subtotals for the shop (scientific laboratory) and place the totals in each memory unit. After computations for a shop (scientific laboratory) have been completed, the accumulation command (L) can be used to accumulate the subtotals of the shops (scientific laboratories) for the entire plant and place the totals in each memory unit. When information on a new shift group or when shop changes are input, the previous totals or accumulated totals are not affected. Each accumulated unit uses a double word length form which can record a maximum of 10^8 yuan, sufficient for all units to be used for 100,000 persons.

The method of deductions for sick and business leave takes into consideration the various different rules and regulations. To satisfy demands of various types of users, the program provides three deduction commands for day, time and minute (T,U,V) and sick leave sign command for users to use. The sick leave sign command is represented by I, the two numbers following I represent the percentage of deduction from the wage. When computing wages with sick and business leave deductions, the internal code and the sick leave sign are input into the machine (those without the sign are treated as business leave) and the day, time and minutes. The program will automatically calculate the amount of deductions and will fill the information in the corresponding deductions unit (K). For example, worker Yi has an internal code 015, he takes 3 and a half days of sick leave and the percentage of deduction from his wages is 30 percent. Thus the string of commands is:

```
A15*I30*T3*U4*
```

The program has a remarks column for the user to specify the unit, the number of people in the group, and the date of issuance of the salary. When printing the inventory sheet or punching the paper tape, the remarks column is also output together for the user to review or to keep on file. When necessary, the user can revise the content of the remarks column via the keyboard.

The program has multiple printing functions. On a definite command, it can output lists of wages of the individuals, groups, shops (scientific laboratories) and the entire plant.

The output equipment for printing the lists can be selected from among the teletype and wide line printers which the program is suited.

To adapt to the need of changes in personnel, the program provides means to add or to delete certain personnel.

In addition, the program also has a "user's window" for the user to revise certain units at any time to facilitate control of the output format, change various computational methods to adapt to the needs of the unit.

The "303-1 general purpose wage program" includes a high performance error checking system, thus assuring a high reliability of the program. The program can automatically and vigorously check every operation of the operator. When the operator inputs an item of a wage parameter, the program will automatically check to see if the "certain person" of that parameter exists. If it is discovered that the code (H) representing that person is zero, the program will show an error sign to indicate there is no such person and will refuse to accept that parameter. When the operator sends a computational command or a keypunch command, the program will automatically check the number of people to see if the actual number of people is the same as the number of people listed in the remark column. If the answer is negative, the program will print out "the number of people is incorrect" as an error indicator and will refuse to execute that order. To prevent errors in the accumulative numbers and the totals due to operating mistakes, the program follows the rule that the accumulation of one unit to the next unit one step above can only be performed once, if an accumulation command is sent as a mistake, the program will indicate "repeated accumulation" as an error and will refuse to execute that operation. In addition, unauthorized commands or irrational demands can all be checked out by the program and will be appropriately processed. Because of this layer by layer check, the program is strongly resistant to interference. No matter how the keyboard is operated, there will be no worry of "inundating the program."

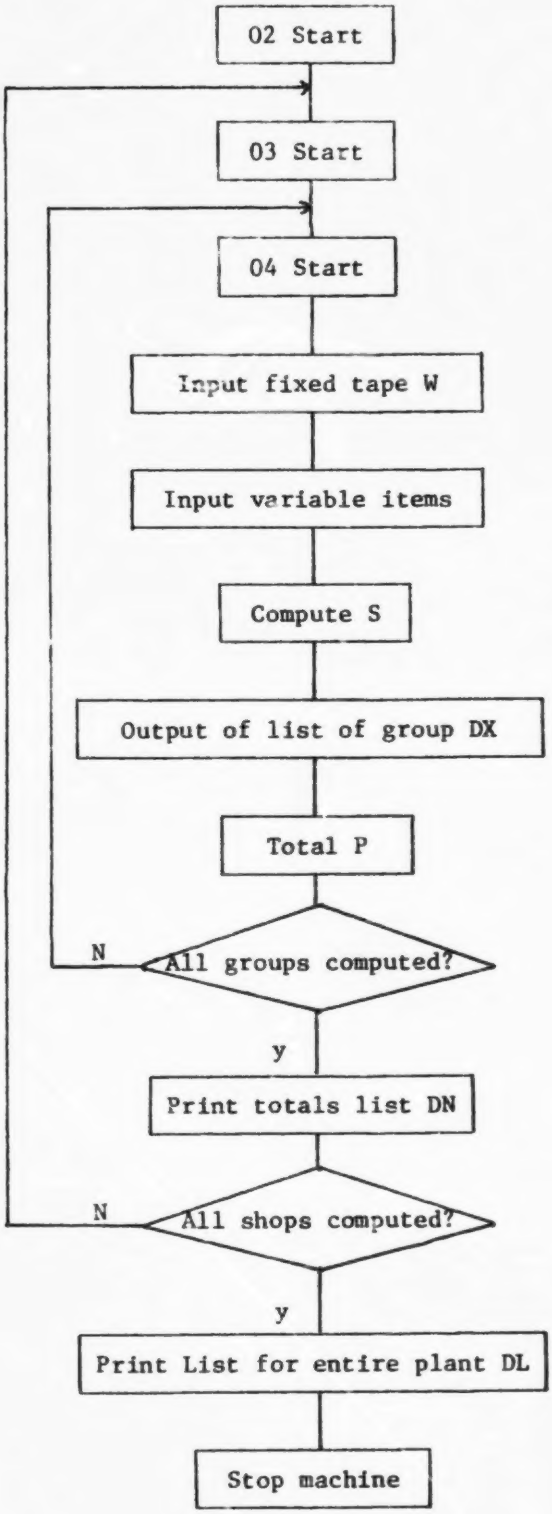
The "303-1 general purpose wage program" is extremely simple to operate and very convenient to use.

The operational flow chart of that program is shown below.

Because the program uses single letters as the names of each of the wage parameters and the commands of each of the parameters for input, and the operation is commanded by single letter commands (except individuals), these commands are easy to remember.

Input of the B type fixed tape provides the operator great convenience and at the same time one paper tape can be used like a disc or magnetic tape. When the operator sends one input command (W), the program will read in a small group of data.

The program has only 30 commands and financial and accounting personnel with only a junior middle school education can operate it after 1 or 2 hours of instruction.


02 Start
03 Start
04 Start
Input fixed tape W
Input variable items
Compute S
Output of list of group DX
Total P
All groups computed?
N
y
Print totals list DN
All shops computed?
N
y
Print List for entire plant DL
Stop machine

Appendix 1 "303-1 General Purpose Wage Program" Commands

Order Number	Commands	Meaning
1	A	Internal code, order number
2	H	Worker number
3	G	Basic wage
4	J	Added wage
5	X	Cleaning cost
6	E	Transportation cost
7	F	Room cost
8	B	Nursery fee
9	C	Meal ticket
10	N	Heating cost
11	Y	Medical cost
12	K	Deductions
13	Q	Others
14	S	Computation
15	P	Total
16	L	Accumulation
17	I	Sick leave sign
18	T	Number of days
19	U	Number of hours
20	V	Number of minutes
21	R	Input A type tape
22	W	Input B type tape
23	ZA	Key A type fixed tape
24	ZB	Key B type fixed tape
25	D1	Print wage table for one worker
26	DX	Print list of one group
27	DH	Print total for shops
28	DL	Print totals for entire plant
29	O	Delete
30	▲	Remark

9296
CSO: 8111/0788

DJS130-PZ5 INTERFACE OPERATION DETAILED

Shanghai DIANZIJISHU [ELECTRONICS TECHNOLOGY] in Chinese No 3, 20 Mar 80 pp 25-26

[Article by Fu Shouchun [0126 1108 2797] and Gu Haoran [7357 3185 3544]: "The DJS130-PZ5 Interface"]

[Text] Ultrahigh frequency testing equipment frequently uses the wave detector or the transducer to transform high frequency electromagnetic energy into low frequency electrical voltage or current, and after magnification, its amplitude is shown by various indicators. Then, these values and other parameters are entered into the corresponding computational formulas for computation of the various characteristics parameters in the ultrahigh frequency transmission, generation and reception systems. In operation, there are two important steps: One is the accurate measurement of the amplitude and the other is the complex computations.

The way to solve the first problem is usually by the use of numerical meters to replace the measuring equipment such as meter heads or light indicators commonly used in the past. The way to solve the latter problem is to use the computer. In general, the small computer is sufficient. But to use these two techniques in isolation, the only way is to manually record the results of each measurement and then the experimental results are written into a program. Via special computer equipment, the program is keyed into the computer on the keyboard of punched on cards, and then input into the computer for computations. This way has a higher accuracy from the viewpoint of accuracy but there is no "real time" operation. Man has to be the intermediary in the relationship between the numerical meters and the computer. Can the human intermediary be eliminated by adding an appropriate interface circuit so that the computer and the testing equipment can be connected? We tried. Some interface circuits (not standard interface) were added between a numerical voltmeter PZ5 and the small computer DJS-130 so that the values measured by the numerical voltmeter could be directly input into the computer. We standardized the device code of the numerical voltmeter and the tele-input device. When operating with a BASIC interpretive program, the values of the voltmeter can be input using INPUT statements of BASIC language, and automatically start the computational program to perform computation. Then, the computational result is output. In this way, an "open loop" semiautomatic measurement as shown in Figure 1 is realized. This has established a foundation for future realization of the "closed loop" fully automatic system (as shown by the dotted line).

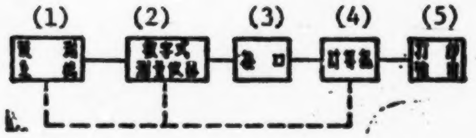


Figure 1

Key:
(1) tested system
(2) digital measuring instrument
(3) interface
(4) computer
(5) printout

Because the interface utilizes the original BASIC language system, none of its interpretive programs has to be added or modified. When inputting data into the computer, the interface is similar to the original tele-input device. To the computer, it is a peripheral equipment equivalent to the tele-input device, therefore the device code of the interface is also "10."

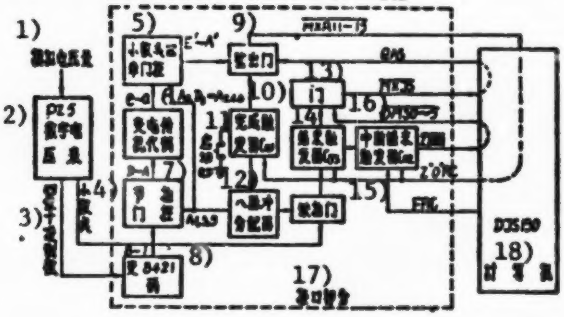
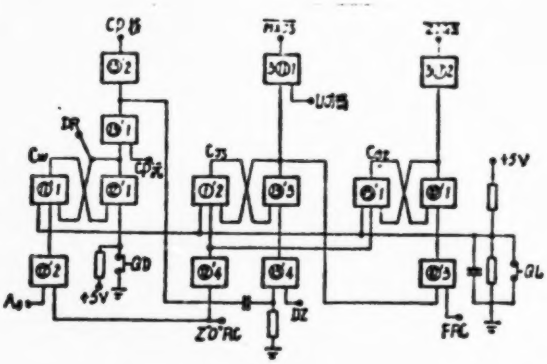


Figure 2

Key:
(1) analog voltage
(2) PZ5 digital voltmeter
(3) four-digit decimal number
(4) decimal point
(5) decimal point carriage return gate control
(6) changed to teletype codes
(7) beat gate control
(8) changed to 8,4,2,1 codes
(9) output gate
(10) completion trigger C_W
(11) start
(12) eight-pulse distributor
(13) gate
(14) termination trigger C_{JS}
(15) missing beat gate
(16) interrupt request trigger C_{QZ}
(17) interface part
(18) computer

The interface operates according to the logic shown in Figure 2. The part of the dotted lines in the diagram is the interface part. As shown in the diagram, the analog voltage measured is first converted to numerical amounts by the numerical amounts by the numerical voltmeter. When the data on the output line of the numerical voltmeter are sent into the computer, pressing the start button QD on the interface will send this group of numbers digit by digit by the process which the tele-input device uses to enter the numbers. The data output by the numerical voltmeter are a group of nonstandardized decimal numbers. To facilitate test manufacture and explanation, the four digits of the effective number of the numerical voltmeter are taken into consideration, including the three digits after the decimal point which may possibly occur together with the carriage return signal as a completely transmitted "word," thus, sending one word of the data requires eight beats time. The eight beats are generated by the eight pulse distributor. The eight pulse distributor is controlled by the completion trigger C_W. It consists of the pulse source CP_{source}, D_1-D_4 shifters and decoder.



When the data of the test are input into the computer, press QD (see Figure 3), set the trigger C_w composed of gate (11)'1 and gate (12)'1 at "1", open gate (13)'1, the pulse from the pulse source CP_{source} passes through gate (13)'1. After passing through gate (13)'2 and the phase is reversed, the pulse enters the shifter via the CP_{shift} serving as a shifter (the shifter is set at full "0" by DR when C_w is cleared), the first pulse only shifts $\overline{D}_4 = 1$ of D_4 into D_1, the carry 4 pulse shifts to full "1", the recarry 4 pulse again shifts to full "0". The decoder decodes the eight beats A_1 - A_0. After the eighth beat A_0 occurs, and when the clear signal of the computer Z"0"RC arrives, C_w is again set at "0" via the gate (12)'2, completing an eight beat cycle.

The first beat sends the first digit, the second beat sends the decimal point, the third beat sends the second digit....... this means, the 1st, 3rd, 5th, 7th beats send the effective digits, the 2nd, 4th, 6th beats send the decimal point, the 8th beat sends the carriage return code. But according to the actual situation of the decimal point of the 2nd, 4th and 6th beats, there is only one beat, and the other two beats do not exist, therefore a signal to interrupt the sending of digits must be requested from the computer:

$$Zd = A_0 + A_1 + A_3 + A_5 + A_7 + A_2S_1 + A_4S_2 + A_6S_3$$

$$= \overline{A_2 + A_4 + A_6} + A_2S_1 + A_4S_2 + A_6S_3$$

$$= \overline{\overline{\bar{A}_2\bar{A}_4\bar{A}_6 + A_2S_1 + A_4S_2 + A_6S_3}}$$

The S_1, S_2, S_3 are the signals of the position of decimal points sent by the numerical voltmeter. The in-between time of each beat for which ZD exists is used by gate (13)'4 to control the trigger C_{JS} to set C_{JS}, when the computer's reference beat pulse FRC of the input and output equipment arrives (on each computational beat, the computer always sends out this pulse), it sets C_{QZ} via gate (10)'3, and it is connected to the bus $\overline{ZDQQ}$ of the computer via OC gate 3(11)2 to request the computer for interruption. After the computer receives interrupt request signal, it sends the radix-minus-one complement of the device code via the bus $\overline{DMSO-5}$. When it reaches the (10) code, after it coincides with the decoding circuit of the (10) code set up in the interface, it is connected to the bus $\overline{MXJS}$ via the OC gate 3(11)1 controlled by C_{JS}, and informs the computer that the selection of equipment selected has been completed. After the computer receives this signal, it sends the pulse QAS to access the numbers in the A buffer register. The pulse goes through the gate 3(15)3 already opened by C_w, and finally via data input into the bus $\overline{MXR11-15}$, the numbers of the numerical voltmeter (equivalent to the A register) are decoded and then sent into the computer.

Because the output of the numerical voltmeter is not standard, each digit of the decimal system is output on 10 lines. When -12 volts occurs on a certain line, each represents 0,1,....,9 in order. Thus these 10 states (taking 9 is sufficient) must first be transformed in electrical level and then into 8,4,2,1 codes. The gate control of the electrical potential of the beat is added to form D,C,B,A signals e,d,c,b,a of the teletypewriter (The 10 states can be directly decoded into the e,d,c,b,a signals, the beat control is added in front of the e,d,c,b,a gates).

Also because the 2,4,6 beats may possibly transmit the decimal point, and the 8th beat transmits the carriage return signal, therefore the carriage return signal is A_o, the control signal of the decimal point is $D_s = A_2 + A_4 + A_6 = \bar{A}_2\bar{A}_4\bar{A}_6$. At the same time, one must notice that when transmitting the carriage return signal and the decimal point signal, e,d,c,b,a are equivalently transmitted as "0", and the corresponding code is "01101". Thus, the signals of the effective numerical codes, the signals of the decimal point, the carriage return signal are finally combined to form the signals E',D',C',B',A'. These signals are connected to the data bus $\overline{MXR11-15}$ of the computer by the OC gate control. After the computer receives the data, the interrupt control program sends the signal Z"O"RC to the equipment and clears C_w, C_{JS} and C_{QZ}. Thus, the entire process of input of data in PZ5 into the DJS-130 computer is realized.

For example, when we measure stationary wave ratios, we only need to connect the direct current signal voltage sent out by the wave detector of the measuring line to the interface system of the numerical voltmeter and computer, and after the computer "begins operation," the BASIC interpretive program is input, the following program is input and the stationary wave ratio can be measured and computed.

```
10      INPUT      N
20      PRINT
30      INPUT      V1, V2
40      PRINT
50      LET        Z = SQR(V1/V2)
60      PRINT      'Z = 'Z
70      GOTO       20
        RUN
```

After this program has been input, the computer executes the program, when it reaches the 10th statement, it prints out a "#" symbol, requests the N value, and dynamically stops the machine. At this time, we must first press the "1...." key on the typewriter, then press the D button on the interface. The typewriter types out a number following the "#" (showing the data can be entered into the computer......) and changes line and types out the "#" symbol to request the numerical value of V1. At this time, the adjustable measuring line can separately measure the greatest and least values. The D is restarted and after two numbers have been input, the computer immediately computes and prints out the computed results Z = ********.

If measurements need to be taken several times, the measuring line can be again the greatest and least values and the QD can be restarted, and the results can be printed out again,

```
Z = ********

............
```

After actual experiment, the use of this interface system to conduct measurements and computations is shown to be very convenient.

9296
CSO: 8111/0787

END

JPRS 77132

8 January 1981

China Report

SCIENCE AND TECHNOLOGY

No. 76

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 77132

8 January 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 76

CONTENTS

APPLIED SCIENCES

Properties of Hydrostatic Bearings, Optimum Design Analyzed
(Xu Shangxian; NANJING GONGXUEYUAN XUEBAO, No 1, 1980)........ 1

PUBLICATIONS

Subject Indexes to 'ZHONGGUO KEXUE,' 'KEXUE TONGBAO'
(ZHONGGUO KEXUE, Dec 80; KEXUE TONGBAO, Dec 80)............. 32

Annual Index
Index to 'SCIENCE BULLETIN'

ABSTRACTS

NATURAL SCIENCES

NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY],
No 4, 1979.. 49

OCEANOGRAPHY

HAIYANG [OCEANS], No 9, 15 Sep 80.............................. 59

[III - CC - 84]

APPLIED SCIENCES

PROPERTIES OF HYDROSTATIC BEARINGS, OPTIMUM DESIGN ANALYZED

Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 1, 1980 pp 97-116

[Article by Xu Shangxian [6079 1424 6343]: "Analysis of the Properties of Hydrostatic Bearings and Optimum Design." This article was received on 22 December 1979]

[Text] Abstract

This article discusses the hydrostatic centripetal slide bearings of the capillary and orifice throttled multiple oil recess and circumferential oil groove. The properties of any number of recesses are analyzed based on the equation of continuity of flow to derive the generalized formulas for computer computation of the pressure in the recess, load capacity and stiffness, amount of flow and power loss. This article also explains the effects of some nondimensional design parameters upon the properties of the bearings.

Because of higher and higher speeds of rotation of the shaft, heating and the rise in temperature of the bearings is a critical problem. Therefore, for a given geometrical dimension of the recess, the computer has been used to calculate the optimum design under the constraints of maximum load capacity and stiffness using power loss as the target function. The penalty function is used to reduce the problem of constrained optimization to a series of problems of unconstrained optimization and Powell's method is used to obtain the optimum solution. A detailed flow chart and FORTRAN program have also been written.

I. Foreword

Hydrostatic bearings rely on the oil pump to provide high pressure oil to the space between the shaft and the bearings forcefully forming an oil film. This in turn provides liquid lubrication at low speeds or even when the shaft is stationary and not rotating. Therefore they possess superior qualities of low resistance due to friction, long life, wide range of rotary speeds, and are shock proof. They are widely used in high precision lathes, large equipment and precision instruments. For the past 30 years, studies of hydrostatic bearings have been widely conducted. As Figure 1 shows, ordinary hydrostatic centripetal bearings use multiple oil recesses (4 to 6 oil recesses). In order to bear the load, high pressure oil channeled through the oil recesses must first be throttled. Ordinarily the throttle is a capillary throttle or an orifice throttle. Between two neighboring oil recesses, a circumferential oil groove is not recommended because when a circumferential oil groove is not present, the amount of flow required is small, and at a high speed of rotation, air flowing directly into the recesses from the oil groove because of the empty holes can be prevented. This article discusses the hydrostatic centripetal slide bearings of the capillary or orifice throttled multiple oil recess and circumferential oil groove. Analysis of this type of bearings is very complex because of the changes in the radial gaps caused by axial eccentricity, the effects of journal rotation and the flow of oil through the oil recesses. The design parameters of the bearings are many (number of oil recesses N, diameter of the shaft D, viscosity μ, velocity υ, gap c, pressure of entering oil p_s, pressure ratio $\bar{p}_n = \frac{p_n}{p_s}$, width of the axial oil sealing surface ℓ, width of the circumferential oil sealing surface ℓ_c, etc). The properties required of the bearings are also many (load capacity, stiffness, amount of flow, power loss, temperature rises, etc). They limit each other and conflict with each other. This forces us to comprehensively consider the influencing factors of all sides and use the computer to realize the optimum design. In view of the increasing speed of rotation of the shaft, heating and the rise in temperature of the bearings is a critical problem. This article discusses the optimum design with power loss as the target function under maximum load capacity and stiffness for given geometric dimensions of oil recesses.

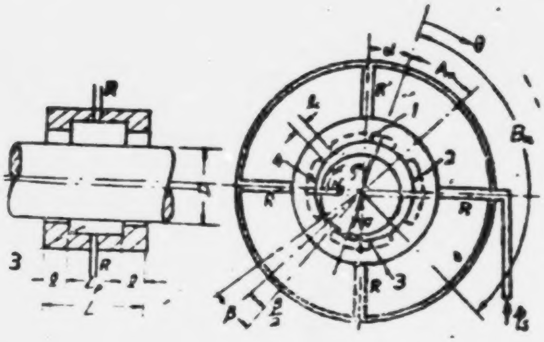


Figure 1.

II. Terms and Symbols

As shown in Figure 1, the top and bottom oil recesses are symmetric about the vertical line. The center line connecting the shaft and the bearings is the polar axis of the polar coordinates. The polar angle θ is measured clockwise.

D ----- journal diameter
L ----- length of bearings
L_p ----- length of oil recess
ℓ ----- width of axial oil sealing surface
ℓ_c ----- width of circumferential oil sealing surface
c ----- radial gap
e ----- eccentric distance
θ ----- polar angle
h ----- thickness of the oil film
$h = c(1 + \varepsilon\cos\theta)$, see equation (8)
L_t ----- length of the capillary tube
d_t ----- diameter of the capillary tube
d_o ----- diameter of orifice
K_o ----- flow coefficient of orifice
N_s ----- speed of rotation of the shaft
----- circumferential speed of the journal
N ----- total number of oil recesses
n ----- numerical order of the oil recess ($n = 1,2,\ldots\ldots.$)
α ----- angle of shift, i.e., the angle between the vertical line and the
β central line connecting the shaft and the center of the bearings
μ ----- central angle faced by the circumferential oil sealing surface
ρ ----- oil viscosity
----- oil density
W ----- load of the bearings
P_s ----- pressure of oil supply
P_n ----- pressure in the nth oil recess
u ----- speed of oil flow
Q ----- amount of flow
H_p ----- power of the oil pump
H_f ----- power loss due to friction
H ----- total power loss, $H = H_p + H_f$

This article also uses the following nondimensional terms:

ε ----- ratio of eccentricity, $\varepsilon = \frac{e}{c}$
A_r ----- ratio of the area of oil recesses and total area of the bearings

$$A_r = \zeta(1 - \frac{2\ell}{L}),$$

ζ ----- ratio of the sum of the area of oil recesses (area of oil recesses + area of the circumferential oil sealing surface)

$\zeta = (1 - \frac{N}{\pi} \frac{\ell c}{D})$, see equation (40)

k ----- ratio of the width of the oil sealing surface $k = \frac{\ell c}{\ell}$

$\bar{m}$ ----- aspect ratio of the oil recesses, see equation (14)

$\bar{p}_n$ ----- pressure ratio, nondimensional, $\bar{p}_n = \frac{p_n}{p_s}$, see equation (5)

δ ----- design parameter of the capillary throttle, see equation (6)

λ ----- design parameter of the orifice throttle, see equation (7)

$\bar{\omega}$ ----- velocity parameter, see equation (15)

$\bar{W}$ ----- nondimensional load coefficient, see equation (26)

$\bar{Q}$ ----- nondimensional flow coefficient, see equation (28)

$\bar{H}$ ----- nondimensional power loss coefficient, see equation (31)

III. Hypothesis

The hypothesis used in this article is basically the same as the hypothesis used in Reference (1), summarized as follows:

1. The model of the bearings is as shown in Figure 1 (Figure 1 illustrates bearings with four oil recesses. The model of the bearings discussed in this article can have N oil recesses). All oil recesses are equal in size and are evenly distributed in the circumferential direction.

2. The fluid must not be compressed, and viscosity μ does not change at different positions on the bearings, i.e., μ = constant.

3. The flow of the liquid between the shaft and the oil sealing surface is laminar flow.

4. The depth of the oil recess is far greater than the radial gap, thus the pressure inside the oil recess can be assured to be generally even and equal.

5. The width of the circumferential oil sealing surface is extremely small compared to the length of the circumference of the oil recess. Therefore, when calculating the load capacity of the oil recess, it is assumed to be the pressure exerted upon the oil recess along the arc drawn between the centers of the oil recess and the neighboring circumferential oil sealing surface.

6. The pressure drop through each axial oil sealing surface is linear and the atmospheric pressure in the surrounding environment is regarded as zero.

7. The gaps at each point on the circumferential oil sealing surface are different and their average value is used as the average gap of the circumferential oil sealing surface.

8. Because the width of the oil sealing surface is small, the effect of dynamic pressure caused by rotation of the shaft is neglected.

9. There is no axial deviation between the shaft and the bearings, therefore the elastic deformation of the shaft and the engine base is neglected.

IV. Equation of Continuous Flow

The multiple recess hydrostatic centripetal bearings generally have four to six oil recesses. For general analysis, it is assumed that there are N evenly distributed oil recesses (Figure 1 shows only four oil recesses). Let the pressure in the nth oil recess be p_n and the pressure in the neighboring two oil recesses be p_{n-1} and p_{n+1}, where the nth oil recess extends from $\theta = A_n$ to $\theta = B_n$, then in the equation,

$$\begin{cases} A_n = \frac{\pi}{N}(2n-3) - \alpha & (1) \\ & (n = 1, 2, \ldots\ldots, N) \\ B_n = A_n + \frac{2\pi}{N} = \frac{\pi}{N}(2n-1) - \alpha & (2) \end{cases}$$

Also, let $p_{n-1} > p_n > p_{n+1}$, then the equation of continuous flow in the nth oil recess can be derived as follows:

(1) The amount of flow Q_1 entering the nth oil recess via the throttle when the pressure of the oil supplied by the oil pump is p_s: We know from fluid dynamics that for the capillary throttle:

$$Q_1 \text{ capillary} = \frac{\pi d_c^4}{128 L_c \mu}(p_s - p_n) = \left(\frac{Dc^3 p_s}{12\mu l}\right) \cdot \delta \cdot (1 - \bar{p}_n) \quad (3)$$

and for the orifice throttle:

$$Q_1 \text{ orifice} = \frac{\pi}{4} K_0 d_0^2 \sqrt{\frac{2}{\rho}(p_s - p_n)} = \left(\frac{Dc^3 p_s}{12\mu l}\right) \cdot \lambda \cdot \sqrt{1 - \bar{p}_n} \quad (4)$$

where the nondimensional pressure ratio $\bar{p}_n = \frac{p_n}{p_s}$; (5)

The nondimensional quantity

$$\delta = \left(\frac{3\pi}{32}\right)\left(\frac{d_c^4 l}{c^3 L_c D}\right) \quad (6)$$

is called the design parameter of the capillary throttle.

The nondimensional quantity

$$\lambda = \frac{3\sqrt{2}\pi\mu d_0^2 K_0 l}{\sqrt{\rho p_s}\cdot c^3\cdot D} \qquad (7)$$

is called the design parameter of the orifice throttle.

(2) The amount of flow Q_2 flowing from the two sides of the axial oil sealing surface when the pressure in the nth oil recess drops to p_n:

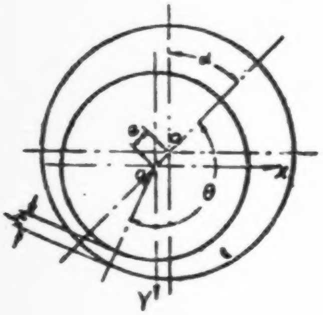
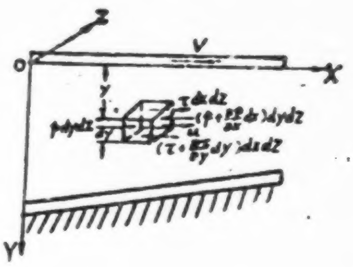


Figure 2.



Z
V
O
X
y
τdxdz
pdydz
$(p+\frac{\partial p}{\partial x}dx)dydz$
dy
u
$(\tau+\frac{\partial \tau}{\partial y}dy)dxdz$
Y

Figure 3.

As Figure 2 shows, when the shaft has an eccentricity e, the gap at any angle θ (i.e., thickness of the oil recess) is

$$h = c(1 + \varepsilon\cos\theta) \qquad (8)$$

When the wedge shaped gap opens up as shown in Figure 3, it is not difficult to derive the equation for the distribution of the velocity of flow on any given cross section from the equilibrium equation of micro-elemental bodies of the oil film, Newton's law of fluid flow and boundary conditions:

$$u = \frac{1}{2\mu}\frac{\partial p}{\partial x}\cdot y(y-h) + \frac{h-y}{h}\cdot v \qquad (9)$$

We can see from the above equation that the speed of flow u at y consists of two terms, the former term is caused by the pressure gradient $\frac{\partial p}{\partial x}$, the latter term is caused by velocity v (equivalent to the circumferential velocity of the journal in the centripetal bearing). When the width in the z direction is b, the amount of flow is

$$Q = b\int_0^h u\,dy = -\frac{b}{12\mu}\frac{\partial p}{\partial x}\cdot h^3 + \frac{bhv}{2} \qquad (10)$$

Since $\frac{\partial p}{\partial x}$ is negative in the equation, the actual value of the amount of flow thus obtained is positive.

Based on the hypothesis (6), the pressure drop on the axial oil sealing surface is regarded as linear, i.e.,

$$\frac{\partial p}{\partial x} = \frac{0 - p_n}{l} = -\frac{p_n}{l}.$$

For the axial flow on the axial oil sealing surface, the second term in equation (9) is zero. Also, the gap h at each point on the axial oil sealing surface varies with angle θ, therefore, in the nth oil recess under a pressure drop of p_n, the amount of flow from the two sides of the axial oil sealing surface is

$$Q_2 = 2\int_{A_n}^{B_n} dQ = 2\int_{A_n}^{B_n} \frac{\frac{D}{2}\,d\theta}{12\mu} \cdot \frac{p_n}{l}[c(1+\varepsilon\cos\theta)]^3 = \left(\frac{Dc^3 p_s}{12\mu l}\right)\cdot F_n \cdot \bar{p}_n \tag{11}$$

where
$$F_n = \int_{A_n}^{B_n} (1+\varepsilon\cos\theta)^3 d\theta \tag{12}$$

(3) The amount of flow Q_3 flowing from the nth oil recess into the (n + 1) oil recess:

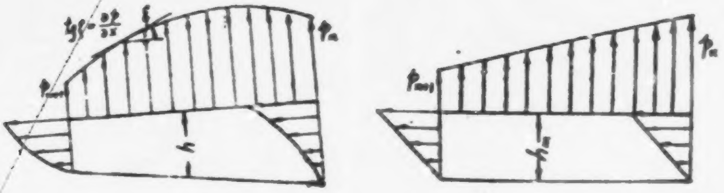
Because the pressure in the neighboring oil recess is not the same and because of the rotation of the shaft, equation (10) shows there is circumferential flow between recesses.

Because the gap h between the points on the circumferential oil sealing surface is not the same, analysis of equation (10) based on the demands of the continuity of flow shows definitely that $\frac{\partial p}{\partial x} \neq$ constant as Figure 4a shows. But the distribution of pressure cannot be easily determined. It can only be based on hypothesis (7). Taking the average value of the gap between the points as the average gap on the circumferential oil sealing surface[1] as shown in Figure 4b, we have

$$\frac{\partial p}{\partial x} = \text{constant} = \frac{p_{n+1} - p_n}{l_c} = -\frac{p_n - p_{n+1}}{l_c}.$$

The average gap on the circumferential oil sealing surface is

$$h_m = \frac{1}{\beta}\int_{B_n - \frac{\beta}{2}}^{B_n + \frac{\beta}{2}} c(1+\varepsilon\cos\theta)\,d\theta$$



a) b)

Figure 4.

Thus, we know from equation (10) that the flow from the nth oil recess into the (n + 1) oil recess is

$$Q_3 = \frac{L_p}{12\mu} \cdot \frac{p_n - p_{n+1}}{l_c} \left[\frac{1}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} c(1+\varepsilon\cos\theta)d\theta\right]^3 + \frac{\pi N_s D L_p}{2}$$

$$\left[\frac{1}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} c(1+\varepsilon\cos\theta)d\theta\right] = m\left(\frac{Dc^3 p_s}{12\mu l}\right)(\overline{p}_n - \overline{p}_{n+1})\cdot H_n^3 \tag{13}$$

$$+\left(\frac{Dc^3 p_s}{12\mu l}\right)\omega\left(\frac{l}{L}\right)\left(\frac{L}{D}\right)^2\left(1-\frac{2l}{L}\right)\cdot H_n$$

where the nondimensional quantity

$$m = \frac{\left(\frac{L}{D}\right)^2\left(\frac{l}{L}\right)\left(1-\frac{2l}{L}\right)}{\left(\frac{l_c}{D}\right)} = \frac{L_p l}{D l_c} \tag{14}$$

is called the aspect ratio of the oil recess.

The nondimensional quantity

$$\omega = \frac{6\mu\pi N_s D^2}{c^2 \cdot p_s} \tag{15}$$

is called the velocity parameter.

The nondimensional quantity

$$H_n = \frac{1}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} (1+\varepsilon\cos\theta)d\theta \tag{16}$$

is known from Figure 1 where

$$\beta = 2N\frac{l_c}{D} \tag{16'}$$

(4) Similarly, the flow Q_4 from the (n + 1) oil recess into the nth oil recess is:

$$Q_4=\left(\frac{Dc^3p_s}{12\mu l}\right)\Big[m(\overline{p}_{n-1}-\overline{p}_n)\cdot H^3_{n-1} + \omega\left(\frac{l}{L}\right)\left(\frac{L}{D}\right)^2\left(1-\frac{2l}{L}\right)H_{n-1}\Big] \tag{17}$$

According to the principle of continuity of flow, the flow into the oil recess (Q_1 + Q_4) = the flow from the oil recess (Q_2 + Q_3), thus when the orifice is throttled:

$$\left(\frac{Dc^3p_s}{12\mu l}\right)\cdot\lambda\cdot\sqrt{1-\overline{p}_n}+\left(\frac{Dc^3p_s}{12\mu l}\right)\Big[m(\overline{p}_{n-1}-\overline{p}_n)H^3_{n-1}+\omega\left(\frac{l}{L}\right)\left(\frac{L}{D}\right)^2\left(1-\frac{2l}{L}\right)H_{n-1}\Big]=\left(\frac{Dc^3p_s}{12\mu l}\right)\cdot F_n\cdot\overline{p}_n+\left(\frac{Dc^3p_s}{12\mu l}\right)\Big[2m(\overline{p}_n-\overline{p}_{n+1})\cdot H^3_n+\omega\left(\frac{l}{L}\right)\left(\frac{L}{D}\right)^2\left(1-\frac{2l}{L}\right)H_n\Big]$$

$$\therefore\quad -C_{n-1}\overline{p}_{n-1}+(F_n+C_n+C_{n-1})\overline{p}_n-C_n\overline{p}_{n+1}=\lambda\cdot\sqrt{1-\overline{p}_n}-\omega S_n \tag{18}$$

This is the nonlinear equation for pressure p in the oil recess. In the equation F_n is determined by equation (12):

$$C_n=m\cdot H^3_n \tag{19}$$

$$S_n=\left(\frac{l}{L}\right)\left(\frac{L}{D}\right)^2\left(1-\frac{2l}{L}\right)(H_{n-1}-H_n) \tag{20}$$

where H_n is determined by equation (16).

A comparison of equations (3) and (4) shows when the capillary tubes are throttled, we only have to change the λ to δ and the nonlinear term $\sqrt{1-\overline{p}_n}$ to the linear term $(1-\overline{p}_n)$ in the above equation and after combining the terms, we obtain the equation for the situation when the capillary tubes are throttled:

$$-C_{n-1}\overline{p}_{n-1}+(F_n+C_n+C_{n-1}+\delta)\overline{p}_n-C_n\overline{p}_{n+1}=\delta-\omega S_n \tag{21}$$

It is thus simplified to a linear equation.

Equations (18) and (21) are respectively the equations of continuous flow in the nth oil recess when the orifice is throttled and when the capillary tube is throttled. They are discussed in the following:

In the equations, the order of the oil recesses is n = 1,2,....N. We notice that when n = 1, $\bar{p}_{n-1} = \bar{p}_o = \bar{p}_N$, $H_{n-1} = H_o = H_N$, i.e., the data of the nth oil recess; when n = N, $\bar{p}_{n+1} = \bar{p}_{N+1} = \bar{p}_1$, $H_{n+1} = H_{N+1} = H_1$ i.e., the data of the first oil recess

$$\bar{p}_n = \frac{p_n}{p_s} \quad \text{(see equation (5))}$$

is a nondimensional quantity, the properties of the bearings are related to it, and it is an important parameter in the design of hydrostatic bearings.[2]

The aspect ratio m of the oil recess is a nondimensional quantity and is determined by equation (14). It describes the relationship of the inner dimensions of the bearings (width of the circumferential oil sealing surface and the width of the axial oil sealing surface). It can be seen in the course of derivation of equation (18) that $\frac{D}{\ell}$ affects the axial flow (see equation (11)), $\frac{L_p}{\ell_c}$ affects the circumferential flow (see equation (13)), therefore m, as a measure of the ratio of circumferential flow between neighboring oil recesses and axial flow in the oil recess, and used to clearly determine the degree of mutual effects of oil recesses, reflects the effect of circumferential flow upon the properties of the bearings, for example, when $\frac{\ell_c}{\ell}$ is small, the effect of circumferential flow is large, therefore it is another important parameter in the design of hydrostatic bearings.

The design parameters δ and λ of the throttles are nondimensional quantities determined by equations (6) and (7). They include the quantities such as the following: diameter d_t of the capillary tube (or diameter d_o of the orifice), radial gap c, pressure p_s of oil supply, viscosity μ of the oil, density ρ and some other quantities selected by the designer to facilitate optimum design. Therefore, they are design variables of hydrostatic bearings. They describe the method of the supply of oil under pressure to the oil recesses and are the bases for designing the throttles.

The velocity parameter ω is a nondimensional quantity determined by equation (15). It reflects the effects of shaft rotation.

Eccentricity ε and angle of shift α describe the position of the shaft among the bearings, therefore the coefficients F_n and H_n are only the functions of the position of the shaft among the bearings.

Thus we know that in the derivation of the equation of continuous flow in the oil recess, the series of nondimensional quantities $\bar{p}_n$, m, δ, λ, ω that appear all have obvious physical significance. They are important design variables in the design of hydrostatic bearings and directly affect the properties of the bearings.

Equation (18) or equation (21) is the general continuous equation of the nth oil recess, thus it is applicable to all oil recesses of the bearings. When we have N oil recesses and unknown oil recess pressure P_n, $(n = 1, 2, \ldots\ldots N)$, there will be N equations which can be solved simultaneously. For example, for the bearing with four oil recesses (see Figure 1), the continuous equations can be written as follows in matrix form.

When the orifice is throttled:

$$\begin{bmatrix} (F_1+C_1+C_4) & -C_1 & 0 & -C_4 \\ -C_1 & (F_2+C_2+C_1) & -C_2 & 0 \\ 0 & -C_2 & (F_3+C_3+C_2) & -C_3 \\ -C_4 & 0 & -C_3 & (F_4+C_4+C_3) \end{bmatrix} \cdot \begin{bmatrix} \bar{p}_1 \\ \bar{p}_2 \\ \bar{p}_3 \\ \bar{p}_4 \end{bmatrix} = \lambda \begin{bmatrix} \sqrt{1-\bar{p}_1} \\ \sqrt{1-\bar{p}_2} \\ \sqrt{1-\bar{p}_3} \\ \sqrt{1-\bar{p}_4} \end{bmatrix} - \omega \begin{bmatrix} S_1 \\ S_2 \\ S_3 \\ S_4 \end{bmatrix} \quad (22)$$

When the capillary tube is throttled:

$$\begin{bmatrix} (F_1+C_1+C_4+\delta) & -C_1 & 0 & -C_4 \\ -C_1 & (F_2+C_2+C_1+\delta) & -C_2 & 0 \\ 0 & -C_2 & (F_3+C_3+C_2+\delta) & -C_3 \\ -C_4 & 0 & -C_3 & (F_4+C_4+C_3+\delta) \end{bmatrix} \begin{bmatrix} \bar{p}_1 \\ \bar{p}_2 \\ \bar{p}_3 \\ \bar{p}_4 \end{bmatrix} = \begin{bmatrix} \delta-\omega S_1 \\ \delta-\omega S_2 \\ \delta-\omega S_3 \\ \delta-\omega S_4 \end{bmatrix} \quad (23)$$

Based on the above group of continuous equations, we can obtain the pressure ratio $\bar{p}_n$ of each oil recess and pressure p_n when the eccentricity $e = 0$, i.e., $\varepsilon = 0$, and the continuous equations (18) and (22) respectively degenerate to the following:

When the orifice is throttled:

$$\frac{r}{\sqrt{1-r}} = \frac{N\lambda}{2\pi} \quad (24)$$

and when the capillary tube is throttled:

$$\frac{r}{1-r} = \frac{N\delta}{2\pi} \quad (25)$$

where the pressure ratio is $r = (\bar{p}_n)_{\varepsilon} = 0$ when the eccentricity is 0 and its value can be obtained easily. It is a very important parameter in the design of bearings.

Load Coefficient $\bar{W}$ of the Bearings

Based on hypothesis (5), it is assumed that the oil pressure in the oil recess acts along $\overline{AB}$ (see Figure 5). Now assume that the oil pressure in the oil recess is evenly distributed along the hypotenuse $\overline{AB}$, $\overline{AB} = D \sin \frac{\pi}{N}$, then the resultant force of the oil pressure in the nth oil recess

$$P_n = p_n DL_p \sin\frac{\pi}{N}$$

∴ The angle between the y axis and the central line of the nth oil recess

$$= \left(B_n - \frac{\pi}{N}\right) + a = \frac{2\pi}{N}(n-1)$$

∴ The horizontal component of p_n ,

$$(P_n)_x = P_n \sin\gamma$$

$$= P_n DL_p \sin\frac{\pi}{N} \sin\left[\frac{2\pi}{N}(n-1)\right]$$

and the vertical component

$$(P_n)_y = P_n \cos\gamma = p_n DL_p \sin\frac{\pi}{N} \cos\left[\frac{2\pi}{N}(n-1)\right]$$

Thus, the horizontal component of the total load of the entire bearing is

$$W_x = DL_p \sum_{n=1}^{N} p_n \sin\frac{\pi}{N} \sin\left[\frac{2\pi}{N}(n-1)\right]$$

The vertical component of the total load of the entire bearing is

$$W_y = DL_p \sum_{n=1}^{N} p_n \,\mathrm{sni}\, \frac{\pi}{N} \cos\left[\frac{2\pi}{N}(n-1)\right]$$

and the total load of the entire bearing is

$$W = \sqrt{W_x^2 + W_y^2} \quad .$$

When reduced to a nondimensional quantity, the defined load coefficient $\bar{W}$ is the ratio of the total load capacity of the bearing and the load capacity under pressure p_s of the oil supply when the area filled with oil is DL_p. Thus

$$\overline{W} = \frac{W}{p_s DL_p} = \sqrt{\overline{W}_x^2 + \overline{W}_y^2} \qquad (26)$$

where

$$\overline{W}_x = \sum_{n=1}^{N} \bar{p}_n \sin\frac{\pi}{N} \sin\left[\frac{2\pi}{N}(n-1)\right],$$

$$\overline{W}_y = \sum_{n=1}^{N} \bar{p}_n \sin\frac{\pi}{N} \cos\left[\frac{2\pi}{N}(n-1)\right]$$

and in Figure 1, the defined load angle

$$\varphi = \mathrm{tg}^{-1}\frac{\overline{W}_x}{\overline{W}_y} \tag{27}$$

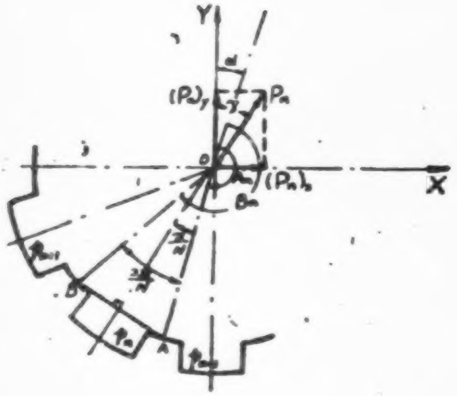


Figure 5.

VI. Flow Coefficient $\overline{Q}$ of the Bearing

To the entire bearing, the flow among the oil recesses is the internal flow among the bearings and the total flow through all the bearings is

$$Q = \sum_{n=1}^{N} Q_n$$

where Q_n --- the flow in each throttle.

For the capillary throttle:

We know from equation (3)

$$Q = \frac{Dc^3 p_s}{12\mu l}\cdot\delta\sum_{n=1}^{N}(1-\overline{p}_n) = \left(\frac{2\pi Dc^3 p_s}{12\mu l}\right)\cdot\frac{\delta}{2\pi}\cdot\sum_{n=1}^{N}(1-\overline{p}_n)$$

For the orifice throttle:

We know from equation (4)

$$Q = \frac{Dc^3 p_s}{12\mu l}\cdot\lambda\cdot\sum_{n=1}^{N}\sqrt{1-\overline{p}_n} = \left(\frac{2\pi Dc^3 p_s}{12\mu l}\right)\cdot\frac{\lambda}{2\pi}\cdot\sum_{n=1}^{N}\sqrt{1-\overline{p}_n}$$

When reduced to a nondimensional quantity, the defined flow coefficient $\bar{Q}$ of the bearing is the ratio of the total flow through the bearings and the flow through the bearings when the eccentricity is zero and the pressure in all of the oil recesses is equal to the pressure p_s of the oil supply, i.e.,

$$\overline{Q}=\frac{Q}{2\,\dfrac{\pi D c^3 p_s}{12\mu l}} \tag{28}$$

∴ For the capillary throttle:

$$\overline{Q}=\frac{\delta}{2\pi}\sum_{m=1}^{N}(1-\overline{p}_m) \tag{29}$$

For the orifice throttle:

$$\overline{Q}=\frac{\lambda}{2\pi}\sum_{m=1}^{N}\sqrt{1-\overline{p}_m} \tag{30}$$

When the eccentricity is zero, equation (29) becomes

$$\overline{Q}=\frac{\delta}{2\pi}\cdot N\cdot(1-r)$$, and substituting

equation (25) into it we get $\bar{Q} = r$; and equation (30) becomes

$$\overline{Q}=\frac{\lambda}{2\pi}\cdot N\cdot\sqrt{1-r}$$, substituting

equation (24) into it we get $\bar{Q} = 4$.

VII. Power Loss Coefficient $\bar{H}$

The total power H lost by the hydrostatic bearing is equal to the sum of the power H_p needed by the pump to supply the bearings with pressured oil and the H_f lost due to the fluid's viscous friction produced by rotation of the shaft around the bearings. The latter includes three parts: (1) friction loss on the axial oil sealing surface; (2) friction loss on the circumferential oil sealing surface; (3) friction loss in the oil recess.

The defined power loss coefficient $\bar{H}$ of the hydrostatic bearing is the ratio of the total power loss in the bearing and the power H_p of the pump needed to supply the bearing with pressured oil when the eccentricity is zero,

i.e.,

$$\bar{H} = \frac{H_p + H_f}{H_p} = 1 + \frac{H_f}{H_p} = 1 + \bar{H}_f \tag{31}$$

The power of the pump needed to supply the bearing with pressured oil is

$$H_p = p_s \cdot Q = \frac{\pi D c^3 p_s^2}{6\mu l} \bar{Q} \tag{32}$$

From equation (9) we know the shearing stress between oil layers is

$$\tau = -\mu \frac{du}{dy} = \frac{1}{2} \frac{\partial p}{\partial x}(h-2y) + \frac{\mu V}{h}$$

At the oil journal, y = 0,

$$\tau\Big|_{y=0} = \frac{h}{2}\frac{\partial p}{\partial x} + \frac{\mu V}{h} \tag{33}$$

and when $\frac{\partial p}{\partial x} = 0$, $\tau\Big|_{y=0} = \frac{\mu V}{h}$ (34)

(1) The friction power loss H_{f1} on the axial oil sealing surface:

The average gap on the axial oil sealing surface $= \frac{1}{2\pi}\int_0^{2\pi} c(1+\varepsilon\cos\theta)d\theta = c$,

to the axial oil sealing surface, the dimension is very short. The circumferential pressure gradient caused by the effects of dynamic pressure can be small enough and neglected, i.e., we can assume that the circumferential pressure gradient $\frac{\partial p}{\partial x} = 0$, therefore from equation (34) we know that the shearing stress at the journal on the axial oil sealing surface is $\tau_{xa} = \frac{\mu V}{c}$, and the area of the axial oil sealing surface is $A_a = 2\pi D\ell$, $V = \pi N_s D$, The friction power loss on the axial oil sealing surface is

$$H_{f1} = \frac{2\pi^3 \mu l D^3 N_s^2}{c} = K_1 \cdot \left(\frac{\pi D c^3 p_s^2 \bar{Q}}{6\mu l}\right)$$

where

$$K_1 = \frac{1}{3\bar{Q}}\left(\frac{l\omega}{D}\right)^2 = \frac{\omega^2}{3\bar{Q}}\left(\frac{l}{L}\right)^2\left(\frac{L}{D}\right)^2 \tag{35}$$

(2) Friction power loss H_{f2} on the circumferential oil sealing surface:

On the circumferential oil sealing surface, according to hypothesis (7), the average value of the gaps at all points is used as that of the average gap, therefore the average gap on the circumferential oil sealing surface behind the nth oil recess is

$$h_n = \frac{c}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} (1+\varepsilon\cos\theta)\,d\theta = cH_n$$

(H_n is determined by (16)). At this time, we can assume that the circumferential pressure gradient is

$$\frac{\partial p}{\partial x} = \text{constant} = \frac{p_{n+1}-p_n}{l_c},$$

then we know from equation (33), the shearing stress at the journal on the circumferential oil sealing surface behind the nth oil recess is

$$\tau_{xi} = \frac{h_n}{2}\cdot\frac{p_{n+1}-p_n}{l_c} + \frac{\mu}{h_n}\cdot V$$

∴ The area of each circumferential oil sealing surface is $A_i = L_p\cdot l_c = L_p\left(\frac{D}{2}\beta\right)$, and its friction resistance is $(T_i)_n = \tau_{xi}\cdot A_i$, then from equation (15), we can represent $V(=\pi N_s D)$ by ω, thus the power loss due to friction on the *N circumferential oil sealing surface is

$$H_{f2} = \sum_{n=1}^{N}(T_i)_n\cdot V = \left(\frac{\pi D c^3 p_s^2 \bar{Q}}{6\mu l}\right)\sum_{n=1}^{N}\left[K_2\cdot H_n\cdot(\bar{p}_{n+1}-\bar{p}_n) + \frac{K_3}{H_n}\right]$$

where

$$K_2 = \frac{\beta m\omega}{4\pi\bar{Q}} \tag{36}$$

$$K_3 = \frac{m l_c \beta\omega^2}{12\pi D\bar{Q}} = \frac{\omega^2\beta}{17\pi\bar{Q}}\cdot\left(\frac{l}{L}\right)\cdot\left(\frac{L}{D}\right)^2\cdot\left(1-\frac{2l}{L}\right) \tag{37}$$

(3) Power loss due to friction in the oil recess:

For the hydrostatic bearing of low speed and deep oil recesses, the friction loss in the oil recesses can be neglected, but for a hydrostatic bearing of high speed, the friction loss in the oil recesses cannot be neglected.

In the oil recesses, the moment of resistance due to friction resulting from the shearing of oil is caused by the pure viscous shearing stress when the flow in the oil recesses is laminar and it is caused by the shearing stress of more complex turbulence and vortical movements when the velocity has surpassed the scope of laminar flow. Here, based on hypothesis (3), discussion will be limited to within the scope of laminar flow. Because the oil recesses are deeper (in general, the depths of the oil recesses are $h_p > 50c$, c --radial gap) and based on hypothesis (4), we can regard the pressure in the oil recesses as generally even and equal, i.e., $\frac{\partial p}{\partial x} = 0$,³ therefore, from equation (34) we know the shearing stress at the journal of the oil recess is

$$\tau_{xp} = \frac{\mu V}{h_p} \qquad (38)$$

Because the depth h_p of the oil recess is far larger than the eccentricity, we can regard the friction resistance in all oil recesses as generally equal, thus the power loss due to friction in the oil recesses is

$$H_{f3} = \frac{\pi \zeta \mu D L_p V^2}{h_p} = K_4 \cdot \left(\frac{\pi D c^3 p_s^2 \overline{Q}}{6 \mu l} \right)$$

where

$$K_4 = \frac{\zeta L_p l c \omega^2}{6 h_p D^2 \overline{Q}}$$

$$\zeta = \frac{\text{area of oil recesses}}{\text{area of oil recesses + area of circumferential oil sealing surface}}$$

$$= 1 - \frac{N l_c}{\pi D} = \frac{l_p}{l_p + l_c} \qquad (40)$$

It can be seen from the above equation that when the velocity is not high and when the oil recess is deeper, the power loss due to friction in the oil recesses is relatively small and can be neglected.

The viscous friction power loss of the entire bearing is $H_f = H_{f1} + H_{f2} + H_{f3}$, reduced to a nondimensional quantity,

$$\overline{H}_f = \frac{H_f}{\left(\frac{\pi D c^3 p_s^2 \overline{Q}}{6 \mu l} \right)} \left[K_1 + K_2 \cdot \sum_{n=1}^{N} H_n (\overline{p}_{n+1} - \overline{p}_n) + K_3 \cdot \sum_{n=1}^{N} \frac{1}{H_n} + K_4 \right] \qquad (41)$$

Thus from equation (31) we know that the power loss coefficient of the entire bearing is $\overline{H} = 1 + \overline{H}_f$.

It can be seen from equation (32) and equation (41) and equations (35), (36), (37), (39) and (15) that power loss is mainly determined by the radial gap c and the velocity parameter ω. The total power loss increases as the speed of rotation increases. In the low speed zone, the main power loss is the pump's power while in high speed zones, the major power loss is power loss due to viscous friction.

VIII. Analysis and Discussion

Based on the above computational formulas, the relationship between the series of properties ($\bar{W}$, $\bar{Q}$, $\bar{H}$) of the multiple recess hydrostatic bearing and changes in the design parameters (m, λ or δ, ω, $\bar{p}_a$ or r) is as follows.

Because there are too many parameters in the design of the bearings and to be able to draw the curves on a plane, only a few parameters can be fixed to observe the effects of the variations of the other parameters upon the properties of the bearing.

(1) The design parameters λ or δ of the throttles:

The curves of variation of the load coefficient $\bar{W}$ along with changes in the design parameters λ or δ are illustrated in Figure 6 and Figure 7 respectively.[4] In the figures, each curve corresponds to a different eccentricity value ε. It can be seen from the figures that when there is no eccentricity ($\varepsilon = 0$), the pressure in each oil recess is equal, and obviously the bearing cannot bear any load. The greater the ε, the greater the load capacity but it is limited by the smallest thickness of the oil film h_{min} ($h_{min} = c\ (1 - \varepsilon)$). When a high speed hydrostatic bearing is used in a precision lathe (such as a grinder) to achieve processing precision as the main objective, ε must be small. For a given value of ε and when the design parameter λ (or δ) is of a definite value, a greatest load coefficient exists. It can be seen from equations (26) and (18) and (22) (or equations (21) and (23)) that the load coefficient $\bar{W}$ is a monotonic continuous function of λ (or δ).

$$\bar{W} = f(\lambda)[\text{or } \bar{W} = f(\delta)],$$

From $\frac{\partial \bar{W}}{\partial \lambda} = 0$ (or $\frac{\partial \bar{W}}{\partial \delta} = 0$) we can solve the value of λ at $\bar{W}_{max}$ (or the value of δ).

The curves of the flow coefficient $\bar{Q}$ as it varies with the changes in the design parameters λ or δ are shown in Figure 8 and Figure 9.

(2) The aspect ratio m of the oil recess: As shown in Figures 6 and 7, when $m \rightarrow 0$, the width of the circumferential sealing surface ℓ_c is very large, there is minimal circumferential flow, $\therefore m = 0$ can be regarded as indicating no circumferential flow, thus the pressure in each oil recess is calculated on the basis that all the oil flow only from the axial oil sealing surface. When m increases, more oil flows from the oil recesses of high pressure to the neighboring oil recesses of lower pressure, leading to a drop in the pressure in the oil recesses and the load capacity drops, as shown in Figure 6 and Figure 7.

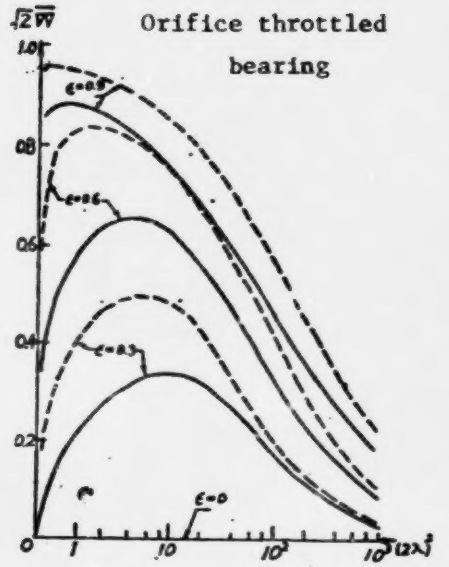


Figure 6

(Dotted line m = 0; i.e., there is no circumferential flow; solid line m = 0.77)

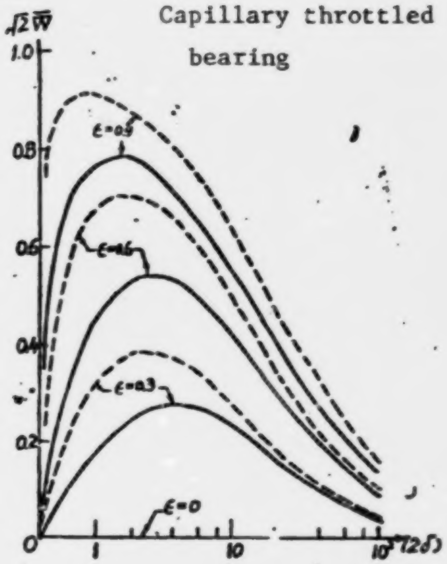


Figure 7

(Dotted line m = 0; i.e, there is no circumferential flow, solid line m = 0.77)

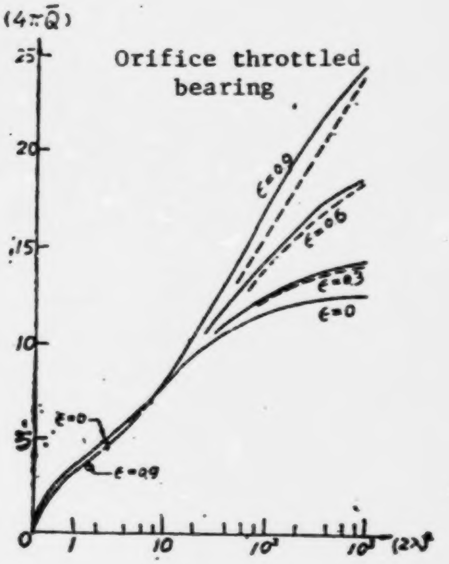


Figure 8

(Dotted line m = 0; i.e., there is no circumferential flow, solid line m = 0.77)

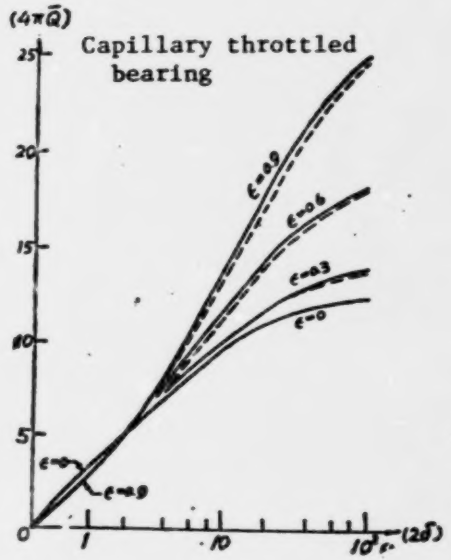


Figure 9

(Dotted line m = 0; i.e., there is no circumferential flow; solid line m = 0.77)

This shows that when m is large, the effect of circumferential flow upon the load capacity cannot be neglected. We know from equation (14) that the method of increasing m is to reduce the width ℓ_c of the circumferential oil sealing surface between neighboring oil recesses, increase the width ℓ of the axial oil sealing surface, increase the axial length L_p of the oil recess or reduce the diameter D of the shaft.

It can be seen in Figure 8 and Figure 9 that m does not exert a great effect upon the flow coefficient $\bar{Q}$. This is because m affects only the ratio of circumferential flow and axial flow in the oil recess. But to the entire bearing, circumferential flow is internal flow and it basically does not affect total flow.

(3) Velocity parameter ω:

There are two causes of circumferential flow: (1) pressure differential of neighboring oil recesses, and (2) velocity of rotation of the shaft.

Figures 10, 11, 12 and Figures 13, 14, 15^5 respectively show the curves of the load W, flow Q and power loss H of the capillary throttle bearings as they vary with the velocity parameter ω.

Capillary throttled bearing

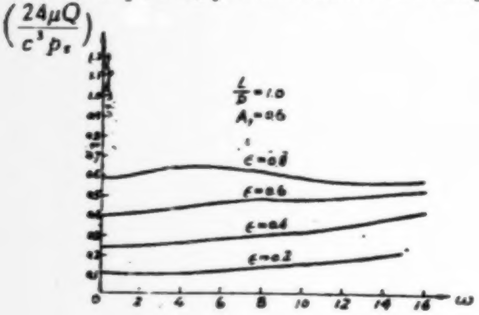


Figure 10

Capillary throttled bearing

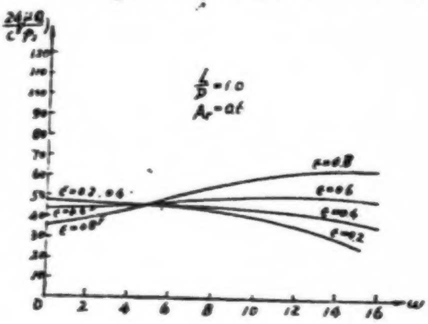


Figure 11

Capillary throttled bearing

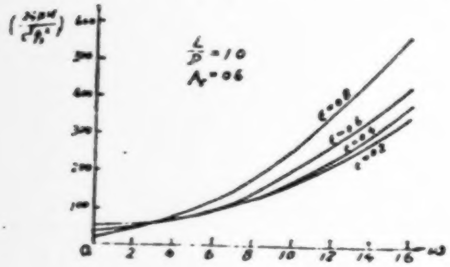


Figure 12

Orifice throttled bearing

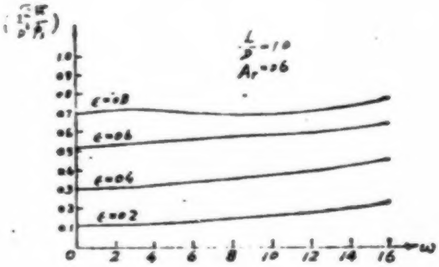
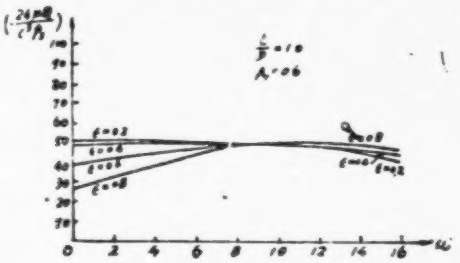
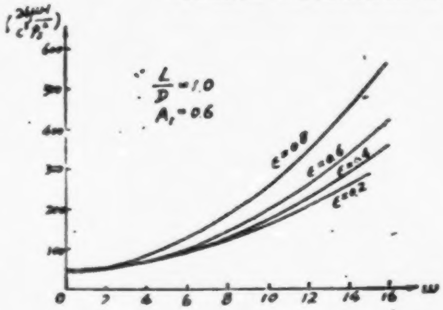


Figure 13



Orifice throttled bearing

Figure 14



Orifice throttled bearing

Figure 15

Figures 12 and 15 show the total power loss H increases as the speed of rotation increases. Figures 11 and 14 show the variation of the power loss H_p of the pump is small, thus the power loss due to viscous friction H_f increases ($\therefore H_f = H - H_p$). This shows that in the low velocity zone, the major power loss is the power of the pump while in the high velocity zone, it is mainly loss due to viscous friction.

The bearing can be designed according to these diagrams, for example, based on the load W, the eccentricity ε, aspect ratio of the oil recess m, and the design parameter λ or δ of the throttles can be determined from Figure 6 or Figure 7; the flow Q can be solved from Figure 8 or Figure 9; the velocity parameter ω can be determined from Figure 10 or Figure 13; and the power loss H can be solved from Figure 12 or Figure 15. But we must note that the prerequisite of Figures 10-15 is: $\frac{L}{D} = 1.0$; $A_r = 0.6$. The following computer program for optimum design can provide the best data and design properties for the design parameters of the bearings under any initial condition.

IX. Optimum Design of the Hydrostatic Bearing

By summarizing the above based on the hypothetical model of the bearing and by writing down the equations of continuity of flow and equations for energy loss, we obtain a series of computational formulas. For a specific fluid hydrostatic centripetal bearing, $\bar{p}_n$ can first be computed from equations (22) or (23), then $\bar{W}$, $\bar{Q}$ and $\bar{H}$ can be computed from equations (26) and (28) or equations (29) and (31). The key to this analysis is to solve the nondimensional pressure $\bar{p}_n$ of the oil recesses. For the capillary throttled bearing, these values can be obtained directly on the computer by solving the linear equations (23) using the inverse matrix method.

Now we use the capillary throttled four oil recess hydrostatic centripetal bearing as an example. The matrix shown in equation (23) can be simplified as

$$AX = B$$

where the matrix of the coefficients is

$$A=\begin{bmatrix} (F_1+C_1+C_4+\delta) & -C_1 & 0 & -C_4 \\ -C_1 & (F_2+C_2+C_1+\delta) & -C_2 & 0 \\ 0 & -C_2 & (F_3+C_3+C_2+\delta) & -C_3 \\ -C_4 & 0 & -C_3 & (F_4+C_3+C_2+\delta) \end{bmatrix}$$

The unknown column matrix is

$$X=\begin{bmatrix} \bar{p}_1 \\ \bar{p}_2 \\ \bar{p}_3 \\ \bar{p}_4 \end{bmatrix}$$

The constant column matrix is

$$B=\begin{bmatrix} \delta-\omega S_1 \\ \delta-\omega S_2 \\ \delta-\omega S_3 \\ \delta-\omega S_4 \end{bmatrix}$$

When we use the standard subroutine for computing the inverse of the matrix, we can obtain the inverse matrix A^{-1} of the coefficient matrix A, thus the solution of the linear equations is

$$X = A^{-1}B$$

To increase the precision, the program flow chart illustrated in Figure 16 can be used.

For the orifice throttled bearing, the damping least square method (Marquardt method) can be used.

As mentioned previously, since the bearing has many design parameters and there are many properties of the bearings that have to be realized and they mutually limit each other, thus the influencing factors on all sides must be comprehensively considered and the computer is used to realize the optimum design. In view of the trend towards faster speed of rotation, heating of the bearing and the rise in temperature are a critical problem. Therefore, this article's discussion of optimum design of the bearing takes power loss as the target function. In the design, it is always hoped that the load capacity can be greater and the stiffness of the bearing can be higher, therefore for given dimensions of oil recesses, the maximum load capacity and maximum stiffness[6] are taken as the constraints. (If the given load is known, the constraining conditions would be that the load capacity of the oil film must equal the external load.) In addition,

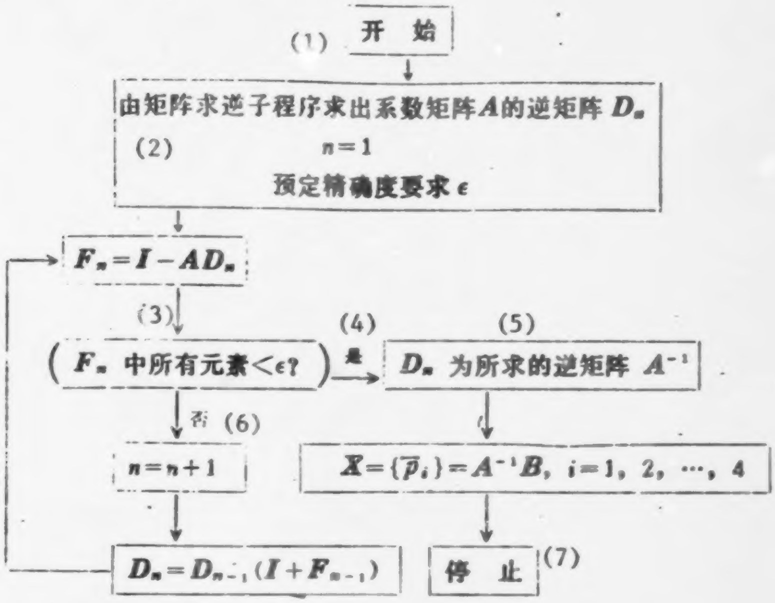

(1) 开 始
由矩阵求逆子程序求出系数矩阵A的逆矩阵 D_n
(2) $n=1$
预定精确度要求 ε
$F_n = I - AD_n$
(3)
F_n 中所有元素 $<\varepsilon$?
(4) 是
(5)
D_n 为所求的逆矩阵 A^{-1}
否 (6)
$n=n+1$
$X=\{\bar{p}_i\}=A^{-1}B,\ i=1,\ 2,\ \cdots,\ 4$
$D_n = D_{n-1}(I+F_{n-1})$
停 止 (7)

Figure 16

Key:
(1) Start
(2) Using the subroutine to obtain the inverse of the matrix to solve the inverse matrix D_n of the coefficient matrix A n = 1

Predetermined precision required is ε
(3) All elements in F_n < ε ?
(4) Yet
(5) D_n is the inverse matrix A^{-1} sought
(6) No
(7) Stop

because of the limitations of the hypothesis used in this article, the ratio of the total area of the oil recesses and the total area of the bearings cannot be less than 0.5. Otherwise, it means the area of the oil sealing surface relative to the area of the oil recesses is too large and these assumptions will be incorrect. Therefore, we let $A_r > 0.5$ be another constraining condition. Some of the bearing parameters can be given beforehand. Parameters that do not change in optimum design are called predetermined parameters. The parameters that directly affect the load and power loss are considered as variable design variables. In the design of the hydrostatic bearing, the speed of rotation N_s of the shaft often has already been determined in the total design of the machinery. Some other parameters such as pressure p_s of the oil supply, radial gap c, eccentricity ε, ratio of length and diameter $\frac{L}{D}$, viscosity μ and the number of oil recesses N are frequently all given beforehand by the predetermined parameters. For example, in a high speed grinder, the main goal is to satisfy processing precision and surface smoothness, and the load capacity is not important. At this time, the eccentricity ε should be given beforehand according to the precision demands. In this way, equations (26) and equations (18), (21,) (22), and (23) show that the load coefficient $\overline{W}$ is related to $\frac{\ell_c}{D}$, $\frac{\ell}{L}$ and λ (or δ). In addition, equations (48) and equations (35), (36), (37) and (47) show the power loss coefficient $\overline{H}$ is also related to $\frac{\ell c}{D}$, $\frac{\ell}{L}$ and λ (or δ). In fact, $\frac{\ell c}{D}$ and $\frac{\ell}{L}$ reflect the effect of the oil sealing surface, λ or (δ) reflects the effect of the throttle. Therefore, $\frac{c}{D}$, $\frac{\ell}{L}$ and λ (or δ) are considered as the design variables. The intermediate variables to be used (working variables) are $\overline{W}$, $\overline{Q}$, $\overline{H}$, a, p_1, p_2, p_3 are functions of the design variables and the predetermined parameters. Therefore, the mathematical model of the optimum design problem of the fluid hydrostatic centripetal bearing is:

$$\left.\begin{array}{ll}\text{Solving the design variable} & \boldsymbol{X}=\left\{\frac{l_e}{D}\ \frac{l}{L}\ \ \lambda(\text{or}\,\delta)\right\} \\ \text{so that the target function} & f(\boldsymbol{X})=\overline{H}_{min}\end{array}\right\} \quad (42)$$

They satisfy the restraining conditions:

$$\left.\begin{array}{ll} g_i(\boldsymbol{X})=\dfrac{\partial\overline{W}}{\partial\lambda(\text{或}\,\partial\delta)}=0 & \text{(or the external load P - W = 0} \\ g_k(\boldsymbol{X})=A_r-\left(1-\dfrac{N}{\pi}\cdot\dfrac{l_e}{D}\right)\left(1-\dfrac{2l}{L}\right)\leqslant 0 & (A_r \text{ can be selected to be 0.5}\end{array}\right] \quad (43)$$

The remaining restraining conditions are

$$\left.\begin{array}{l} 0\leqslant\dfrac{l_e}{D}\leqslant\dfrac{\pi}{N} \\ 0\leqslant\dfrac{l}{L}\leqslant\dfrac{1}{2} \\ 0\leqslant\lambda\ (\text{or}\,\delta)\end{array}\right\} \quad (44)$$

Because the target function and the restraining conditions are nonlinear functions of the design variables, this is a nonlinear programming problem with constraints. In the optimum design of hydrostatic bearing discussed in this article, the expressions of the target function and the constraining conditions are more complex, and it is difficult to compute the derivatives. But they are still quadratic type functions, therefore it was decided to use the penalty function method and Powell's method which does not require the computation of derivatives for computing the optimum design. To reduce the problem of optimization with constraints (equations (42)-(44)) to a series of problems of optimization without constraints, we can construct a new penalty function F(X) based on the quadratic type conditions of constraints (43) as follows:

Let

$$g_i^+(X) = (g_i(X))^2$$

$$g_h^+(X) = \frac{1}{2}[\,|g_h(X)|\,g_h + (X)]$$

then $$F(X) = f(X) + M\cdot[g_i^+(X) + g_h^+(X)] \qquad (45)$$

where the penalty factor M in the equation is a large positive number. In this way, the problem of optimum design with constraints expressed by equations (42) and (43) becomes a problem of solving a series of unconstrained functions F(X) for their unconditional minima:

Solving the design variable

$$X = \left\{ \frac{l_c}{D} \; \frac{l}{L} \; \lambda \text{ (or } \delta) \right\} \qquad (46)$$

so that the unconstrained target function (F(X), M_k) is minimum, while

$$0 < M_1 < M_2 < \cdots\cdots < M_{K-1} < M_K < M_{K+1} < \cdots\cdots$$

$$\lim_{K\to\infty} M_K = \infty,$$

We first begin by searching the outer part of the feasibility range. When we are far away from the border of the feasibility range, M_k is relatively small. As M is taken as larger positive numbers, the solution of unconditional extrema $X = X(M_k)$ of the corresponding series of penalty functions $(F(X, M_k))$ becomes closer and closer to the feasibility range. When M is taken to be sufficiently large (→ ∞), the solution X_k $(=X^*)$ is the optimum solution obtained by gradually approaching the border of the feasibility range from the outside, i.e., the optimum solution of the original hydrostatic bearing design. Its program flow chart is shown in Figure 17.

Because the expression (45) of the penalty function (F(X)) is complex, calculating the derivatives is difficult, therefore a direct search method is used--Powell's method.[8] Its program flow chart is shown in Figure 18.

The one dimensional search in the program flow chart (Figure 18) of Powell's method used the 0.618 method. Its program flow chart can be located in Reference (11).

The design equations and optimum design programs combined in Figures 16-18 described above provide the method of computation for the optimum design of the design variables $\frac{\ell c}{D}$, $\frac{\ell}{L}$ and λ (or δ) using the computer, and taking power loss as the target function and the load capacity and stiffness as constraints. The FORTRAN program for the design of the four recess hydrostatic centripetal bearing has been written and compiled according to this flow chart. Based on this program, the best data for the rational selection of dimensions of the oil recesses and the design parameters of the throttles in the design of hydrostatic bearings can be obtained.

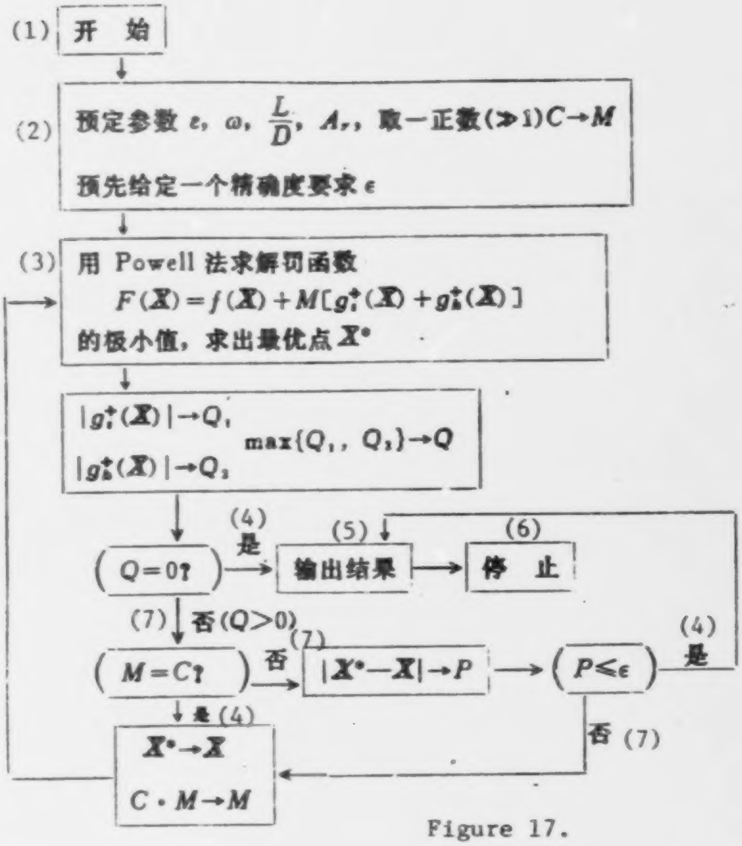

(1) 开 始
(2) 预定参数 ε, ω, $\frac{L}{D}$, A_r, 取一正数(≫1)$C\to M$
预先给定一个精确度要求 ε
(3) 用 Powell 法求解罚函数
$F(X)=f(X)+M[g_i^t(X)+g_h^t(X)]$
的极小值，求出最优点 X^*
$|g_i^t(X)|\to Q_1$
$|g_h^t(X)|\to Q_2$
$\max\{Q_1, Q_2\}\to Q$
$Q=0$?
(4) 是
(5) 输出结果
(6) 停 止
(7) 否($Q>0$)
$M=C$?
否 (7)
$|X^*-X|\to P$
$P\leq\varepsilon$
(4) 是
否 (7)
是 (4)
$X^*\to X$
$C\cdot M\to M$

Figure 17.

Key:
(1) Start
(2) Predetermined parameters ε, ω, $\frac{L}{D}$, A_r, take a positive number (>> 1) C →M
Given precision demand beforehand
(3) Use Powell's method to solve the minimum value of the penalty function $F(X) = f(X) + M[g_i^t(X) + g_h^t(X)]$ to find the optimum point X*.
(4) Yes
(5) Output result
(6) Stop
(7) No

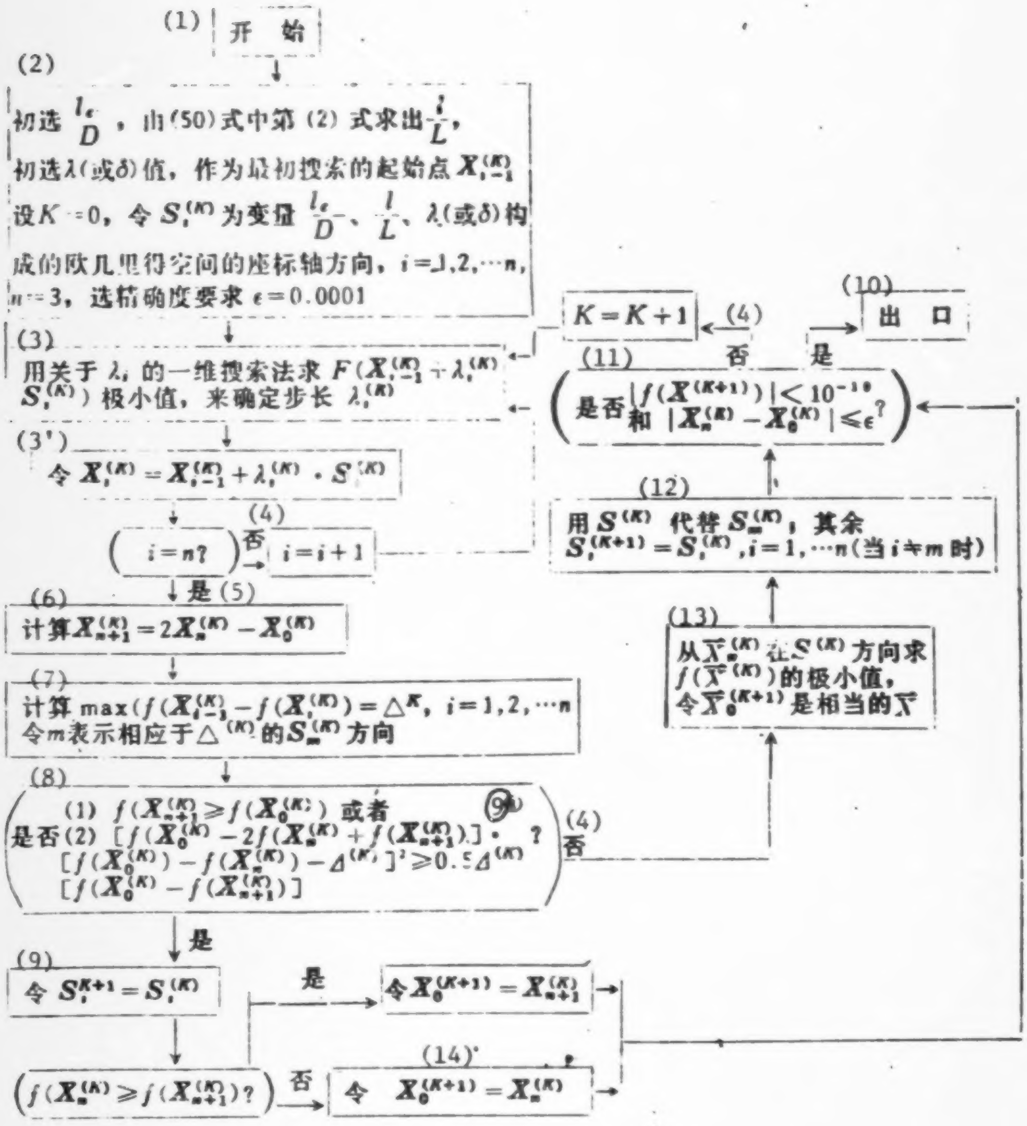

(1) 开 始
(2) 初选 $\frac{l_c}{D}$，由(50)式中第(2)式求出 $\frac{l}{L}$，初选λ(或δ)值，作为最初搜索的起始点 $X_{i-1}^{(K)}$ 设K=0，令 $S_i^{(K)}$ 为变量 $\frac{l_c}{D}$、$\frac{l}{L}$、λ(或δ)构成的欧几里得空间的座标轴方向，i=1,2,…n，n=3，选精确度要求 ε=0.0001
(3) 用关于 λ_i 的一维搜索法求 $F(X_{i-1}^{(K)}+\lambda_i^{(K)}S_i^{(K)})$ 极小值，来确定步长 $\lambda_i^{(K)}$
(3') 令 $X_i^{(K)}=X_{i-1}^{(K)}+\lambda_i^{(K)}\cdot S_i^{(K)}$
i=n?
(4) 否
i=i+1
是 (5)
(6) 计算 $X_{n+1}^{(K)}=2X_n^{(K)}-X_0^{(K)}$
(7) 计算 $\max(f(X_{i-1}^{(K)})-f(X_i^{(K)}))=\triangle^K$，i=1,2,…n 令m表示相应于 $\triangle^{(K)}$ 的 $S_m^{(K)}$ 方向
(8) 是否 (1) $f(X_{n+1}^{(K)})\geq f(X_0^{(K)})$ 或者 (2) $[f(X_0^{(K)})-2f(X_n^{(K)})+f(X_{n+1}^{(K)})]\cdot[f(X_0^{(K)})-f(X_n^{(K)})-\Delta^{(K)}]^2\geq 0.5\Delta^{(K)}[f(X_0^{(K)})-f(X_{n+1}^{(K)})]$?
(9)
(4) 否
是
(9) 令 $S_i^{K+1}=S_i^{(K)}$
是
令 $X_0^{(K+1)}=X_{n+1}^{(K)}$
$f(X_n^{(K)})\geq f(X_{n+1}^{(K)})$?
否
(14)
令 $X_0^{(K+1)}=X_n^{(K)}$
(13) 从 $\overline{X}_n^{(K)}$ 在 $S^{(K)}$ 方向求 $f(\overline{X}^{(K)})$ 的极小值，令 $\overline{X}_0^{(K+1)}$ 是相当的 $\overline{X}$
(12) 用 $S^{(K)}$ 代替 $S_m^{(K)}$，其余 $S_i^{(K+1)}=S_i^{(K)}$，i=1,…n(当i≠m时)
(11) 是否 $|f(X^{(K+1)})|<10^{-10}$ 和 $|X_n^{(K)}-X_0^{(K)}|\leq\epsilon$?
否 (4)
是
K=K+1
(10) 出 口

Figure 18

Key:

(1) Start

(2) First select $\frac{\ell c}{D}$, solve $\frac{\ell}{L}$ from equation (2) in equations (50), first select the value of λ (or δ) as the starting point for the initial search $X_{i-1}^{(K)}$

Let K = 0, let $S_i^{(K)}$ be the direction of the coordinate axis of the Euclidean space constructed by the variables $\frac{\ell c}{D}$, $\frac{\ell}{L}$, λ (or δ), i = 1,2,........n, n = 3, the precision required is = 0.0001

[Key to Figure 18 continued]

(3) Use the one dimensional search for λ_i to obtain the minima of $F(X_{i-1}^{(K)} + \lambda_i^{(K)} S_i^{(K)}$ and determine the step length $\lambda_i^{(K)}$

(3') Let $X_i^{(K)} = X_{i-1}^{(K)} + \lambda_i^{(K)} \cdot S_i^{(K)}$

(4) No

(5) Yes

(6) Compute $X_{n+1}^{(K)} = 2X_n^{(K)} - X_0^{(K)}$

(7) Compute $_{\max} f(X_{i-1}^{(K)} - f(X_i^{(K)}) = \Delta^K$, $i = 1,2,\ldots n$

Let m represent the $S_m^{(K)}$ direction of $\Delta^{(K)}$

(8) Whether (1) $f(X_{n+1}^{(K)} \geqslant f(X_0^{(K)}$

(2) $[f(X_0^{(K)} - 2f(X_n^{(K)} + f(X_{n+1}^{(K)})].$?

$[f(X_0^{(K)}) - f(X_n^{(K)}) - \Delta^{(K)}]^2 \geqslant 0.5\, \Delta^{(K)}$

$[f(X_0^{(K)} - f(X_{n+1}^{(K)})]$

(9) Let $S_i^{K-1} = S_i^{(K)}$

(10) Output

(11) Whether $\begin{pmatrix} |f(X^{(K+1)})| < 10^{-10} \\ |X_n^{(K)} - X_0^{(K)}| \leqslant \varepsilon \end{pmatrix}$?

(12) Substitute $S^{(K)}$ for $S_m^{(K)}$, the remaining $S_i^{(K+1)} = S_i^{(K)}$, $i = 1, \ldots n$

(when $i \neq m$)

(13) Solve the minima of $f(\vec{X}^{(K)})$ from $\vec{X}_n^{(K)}$ in the $S^{(K)}$ direction and let $\vec{X}_o^{(K+1)}$ be the equivalent of $\vec{X}$.

(14) Let $X_o^{(K+1)} = X_{n+1}^{(K)}$

FOOTNOTES

1. The author of Reference (1) used the gap at the central point on the circumferential oil sealing surface as the average gap. This basis is somewhat incorrect, especially when the eccentricity ε is large, the error is large.

   The author of Reference (3) corrected this and used the average value of the gaps on the circumferential oil sealing surface as the average gap, but a mistake was made in the derivation. The main mistakes were taking

   $$\overset{1}{\overline{\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} H\,d\theta}} \quad \text{as} \quad \int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} \frac{d\theta}{H}, \qquad ;$$

   and taking

   $$\left[\frac{1}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} c(1+\varepsilon\cos\theta)\,d\theta\right]^3 \quad \text{as} \quad \frac{1}{\beta}\int_{B_n-\frac{\beta}{2}}^{B_n+\frac{\beta}{2}} c^3(1+\varepsilon\cos\theta)^3\,d\theta$$

2. It is not difficult to derive $\overline{p}_n = \frac{1}{(1+\xi)}, \xi = \frac{R_i}{R_o}$,
   R_i----- resistance coefficient of the throttle, R_o ----- resistance coefficient of the oil sealing surface, thus for $\overline{p}_n$ here, when compared to the resistance in Reference (5), ξ has the same physical meaning.

3. If the friction resistance caused by the pressure gradient in the oil recess is considered, see Reference (4).

4. Figure 6 - Figure 9 are taken from Reference (1).

5. Figures 10-15 are taken from Reference (3).

6. Stiffness J is defined as $J = \left|\frac{\partial W}{\partial e}\right|$ or $\left|\frac{\partial \overline{W}}{\partial \varepsilon}\right|$

   since the optimum design here has taken ε as a predetermined parameter and is given beforehand, therefore J_{max} and W_{max} are consistent.

7. For definite dimensions of the oil recess, the nondimensional load capacity $\overline{W}$ is the monotonic continuous function of the design parameter λ (or δ) of the throttle (see Figure 6, Figure 7), thus based on

   $\frac{\partial \overline{W}}{\partial\lambda\,(\text{或}\,\partial\delta)} = 0,$ the λ (or δ) of maximum load capacity can be obtained.

8. Although the author of Reference (3) used Powell's method, it was used only to adjust one variable. This can actually be realized by a one-dimensional search, thus Reference (3) used Powell's method in form, but actually it was only a method of rotation of coordinates.

9. According to Reference (10), the two complex conditions here can be equivalently substituted by the following singular simple condition

$$\left(\frac{1}{2}\left[(f\vec{X}_0 - 2f(\vec{X}_n) + f(\vec{X}_{n+1}) \right] \geqslant \Delta ? \right).$$

REFERENCES

1. Raimondi, A. A. & Boyd, J.: An Analysis of Orifice and Capillary-Compensated Hydrostatic Journal Bearings, Lubrication Engineering, Vol 13, No 1, 1957.

2. Davies, P. B.: A General Analysis of Multi-Recess Hydrostatic Journal Bearings. Proceedings of the Institution of Mechanical Engineers, Vol 184, Part 1, No 43, 1969-70.

3. Cusano, C. & Conry, T. F.: Design of Multi-Recess Hydrostatic Journal Bearings for Minimum Total Power Loss, Transaction of the ASME Series B Journal of Engineering for Industry, Vol 96, No 1, 1974.

4. Shinkle, J. N. & Hornung, K. G.: Frictimal Characteristics of Liquid Hydrostatic Journal Bearings, Journal of Basic Engineering. Trans. ASME, Series D. Vol 87, No 1, March, 1965.

5. Stansfield F. M.: Hydrostatic Bearings for Machine Tools and Similar Applications. The Machinery Publishing Co. Ltd. 1970.

6. Powell, M.J.D.: An Efficient Method for Finding the Minimum of a Function of Several Variables Without Calculating Derivatives. Computer Journal, Vol 7, 1964.

7. Himmelblau, D. M.: Applied Nonlinear Programming. McGraw-Hill Book Co, New York, 1972.

8. Guangzhou Lathe Research Institute: Principles and Application of Liquid Hydrostatic Technology, 1978.

9. Li Bingwei [2621 3521 1218]: Optimum Design of Structures, 1979.

10. Optimum Selection Group of the Operations Research Laboratory of the Institute of Mathematics of the Chinese Academy of Sciences: Methods of Optimization, 1978.

11. Computational Mathematics Staff of the Department of Mathematics of Nanjing University: Method of Optimization, 1978.

12. Gallagher, R. H., Zienkiewicz, J.W. & Sons Ltd. Theory and Application of Optimum Structural Design, translated by Chen Xiaoan [7115 1321 1344] et al, 1978.

13. Second Laboratory of the Physics Institute of the Chinese Academy of Sciences: FORTRAN Commonly Used Computational Programs Library, 1978.

14. Ralph H. Pendington: Introduction to Computer Method and Numerical Analysis, translated by the mathematics teaching and research group of Nanjing Engineering College, 1979.

15. Physics Institute of the Chinese Academy of Sciences: Lecture Notes on FORTRAN Program Design, Computer Reference Materials, 1977, No 1,2, (Printed by the 82 teaching and research group of the Nanjing Engineering College).

16. Fundamentals of FORTRAN Language Program Design, National Defense Industry Press, 1978.

9296
CSO: 8111/0115

PUBLICATIONS

SUBJECT INDEXES TO 'ZHONGGUO KEXUE,' 'KEXUE TONGBAO'

Annual Index

Beijing ZHONGGUO KEXUE in English Vol 23 No 12, Dec 80 unpaginated, last three pages in publication

[Following is annual index arranged by broad category of Chinese scientific journal ZHONGGUE KEXUE [SCIENTIA SINICA] for calendar year 1980]

[Text]

Mathematics

A Simple Proof of Bieberbach Conjecture for Sirth Coefficient ······················ *Gong Sheng* (龚　昇) (1)

Angular Distribution and Multiple Values Between Entire Functions and Their Derivatives ······················ *Yang Le* (杨　乐) (16)

On Pólya Peaks ······················ *Zhuang Qitai* (庄圻泰) (141)

A Concrete Example of the Existence of Four Limit Cycles for Plane Quadratic Systems ······················ *Shi Songling* (史松龄) (153)

Sojourn Times and First Passage Times for Birth and Death Processes ········ *Wang Zikun* (王梓坤) (269)

Generalized Riemann-Hilbert Boundary Value Problem for a System of Second Order Linear Elliptic Equations ······················ *Li Mingzhong* (李明忠) (280)

On Direct Transcendental Singularities of the Inverse Function of an Algebroidal Function ······················ *Lü Yinian* (吕以辇) (407)

The Exceptional Set of Goldbach-number (I) ······················ *Chen Jingren* (陈景润) and *Pan Chengdong* (潘承洞) (416)

Multiple Solutions for Asymptotically Linear Operators ······················ *Zhang Gongqing* (张恭庆) and *Jiang Boju* (姜伯驹) (539)

Equation of a Phase Locked Loop With Tangent Discriminator and Frequency Modulation Input and Its Generalization ······ *Wang Muqiu* (王慕秋), *Wang Lian* (王　联) and *Zhang Jinyan* (张锦炎) (554)

The Generic Properties of Solutions of a Conservation Law ······················ *Li Banghe* (李邦河) (673)

Discrete Phenomena in the Uniqueness of the Cauchy Problem in Multiple Independent Variables ······················ *Lu Zhujia* (陆柱家), *Mai Mingcheng* (麦明澄) and *Wang Guangyin* (王光寅) (690)

On the Non-normal Operators——Semi-hyponormal Operators ······················ *Xia Daoxing* (夏道行) (700)

Propriété de Représentation Prévisible Pour Les Semimartingales Spéciales ······ *Yan Jia'an* (严加安) (803)

Multi-criteria Dynamic Programming ······················ *Wu Cangpu* (吴沧浦) (814)

On the Boundary Conditions for Partial Differential Equations ······················ *Gu Chaohao* (谷超豪) (939)

Calculus of Variations With Strong Nonlinearity ······················ *Ding Xiaxi* (丁夏畦), *Luo Peizhu* (罗佩珠), *Gu Yonggeng* (顾永耕) and *Fang Huizhong* (方惠中) (945)

On Limiting Properties of U-statistics and von-Mises Statistics ······················ *Chen Xiru* (陈希孺) (1079)

W Transformation and Strong Limit for Denumerable Markov Processes ······ *Yang Xiangqun* (杨向群) (1092)

Generating k-ary Trees in Lexicographic Order ······················ *Zhu Yongjin* (朱永津) and *Wang Jianfang* (王建方) (1219)

A Family of Fields With Finite Square Class Number ······················ *Li Delang* (李德琅) (1226)

Local Solvability of the Boundary Value Problems for Quasilinear Hyperbolic Systems ······ *Li Daqian* (李大潜) and *Yu Wenci* (俞文鮆) (1357)
On the Upper Bound of the Number of Ways to Represent an Even Integer as a Sum of Two Primes ······ *Pan Chengbiao* (潘承彪) (1368)
A Numerical Method With High Accuracy for Calculating the Interactions Between Discontinuities in Three Independent Variables ······ *Zhu Youlan* (朱幼兰) and *Chen Bingmu* (陈炳木) (1491)
Theorem of Existence of Exact n Limit Cycles in $|\dot{x}|\leqslant(n+1)\pi$ for the Differential Equation $\ddot{x}+\mu\sin\dot{x}+x=0$ ······ *Zhang Zhifen* (张芷芬) (1502)

Physics

The Non-topological Soliton With a Non-abelian Internal Symmetry ······ *Zhou Guangzhao* (周光召), *Zhu Zhongyuan* (朱重远), *Dai Yuanben* (戴元本) and *Wu Yongshi* (吴詠时) (40)
A New Way to Superhigh Energy With a Phase-adjusted Focusing Laser Accelerator ······ *Peng Huanwu* (彭桓武) and *Zhuang Jiejia* (庄杰佳) (159)
A Theory of Conformal Gravity and Conformal Supergravity ······ *Chen Shi* (陈 时), *Guo Hanying* (郭汉英), *Li Gendao* (李根道) and *Zhang Yuanzhong* (张元仲) (299)
On the Vacuum of the Pure Gauge Fields on Coset ······ *Zhou Guangzhao* (周光召) (431)
Dislocations, the Elastic Energy Momentum Tensor and Crack Propagation ······ *Lung Qiwei* (龙期威) (441)
A Model of Electro-weak Interaction in $SU(3)\times U(1)$ Gauge Theory ······ *Zhou Guangzhao* (周光召) and *Gao Chongshou* (高崇寿) (566)
Scaling and the Violation of Scaling ······ *Hu Ning* (胡 宁) (714)
The Measurement of Audiometric Zero Level of Air Conduction ······ *Zhang Jucai* (章句才), *Deng Yuancheng* (邓元诚) and *Wen Guangxin* (文光新) (726)
Unitary Symmetry in Baryon-antibaryon Systems ······ *Chen Xiaotian* (陈晓天), *Ruan Tu'nan* (阮图南), *Zhang Yushun* (张禹顺) and *Li Yangguo* (李扬国) (823)
Generalized Lower-hybrid-drift Instability ······ *Xia Jianbai* (夏建白), *Qiu Xiaoming* (邱孝明), *Xia Mengfen* (夏蒙芬), *Zhou Ruling* (周如玲) and *C. S. Wu* (吴京生) (956)
On a Variational Principle in the Theory of Dynamic Stability of Elastic Systems ······ *Hu Haichang* (胡海昌) (1110)
Experimental Investigations on Shock-associated Noise ······ *Ma Dayou* (马大猷), *Li Peizi* (李沛滋), *Dai Genhua* (戴根华) and *Wang Hongyu* (王宏玉) (1237)
The Problem of Convergence Radius of the T_c Series Solution ······ *Zhou Zifang* (周子舫), *Wu Hangsheng* (吴杭生), *Mao Deqiang* (毛德强) and *Gu Yiming* (顾一鸣) (1378)
"Generalized Substructure Method" in Finite Element Analysis of Elastic Contact Problems ······ *Guo Zhongheng* (郭仲衡) (1511)
A Relativistic Glauber Expansion for Many-body System ······ *Zhu Xiquan* (朱熙泉), *He Zuoxiu* (何祚庥), *Zhao Weiqin* (赵维勤) and *Bao Chengguang* (鲍诚光) (1522)

Chemistry

Specific Adsorption of Strong Electrolytes and the Nature of the Electrical Double Layer ——Study of the Interface Excess Activity Coefficient ······ *Liu Zhenghui* (柳正辉) (61)
Catalytic Activities of Lanthanide Compounds in the Polymerization of Isoprene ······ *Wang Fosong* (王佛松), *Sha Renyu* (沙人玉), *Jin Yingtai* (金鹰泰), *Wang Yuling* (王玉玲) and *Zheng Yulian* (郑玉莲) (172)
Characterization of Cis-1,4-polybutadiene Raw Rubber ······ *Laboratory of High Polymer Physics, Changchun Institute of Applied Chemistry, Academia Sinica* (180)
Studies on the Performance of YWG Microparticulate Silica in High Performance Liquid Chromatography (HPLC) ······ *Zhang Renbin* (张仁斌), *Yang Yiming* (杨一鸣), *Zhao Guodong* (赵国栋), *Wang Shengqun* (王圣群) and *Gu Qun* (顾 群) (308)
Researches on Chemical Carcinogens and Mechanism of Chemical Carcinogenesis Di-region Theory ——A Quantitative Molecular Orbital Model of Carcinogenic Activity for Polycyclic Aromatic Hydrocarbons ······ *Dai Qianhuan* (戴乾圜) (453)
On the Stability of Complexes of Dinitrogen and Transition Metals ······ *Yao Yulin* (姚玉林) (471)

Quantum Chemical Basis of the Rule of Homologous Linearity for the Energy of Molecular Orbitals and Related Properties ······ *Xu Guangxian* (徐光宪) and *Li Lemin* (黎乐民) (574)
Studies of the Activity Coefficients and Solvation Numbers of the Electrolytes in Mixed Solvents ——Systems of Salts, Methanol and Nonelectrolytes ······ *Li Zhifen* (李芝芬), *Huang Ziqing* (黄子卿) and *Liu Ruilin* (刘瑞林) (590)
A Higher Active Lanthanide Chloride Catalyst for Stereospecific Polymerization of Conjugated Diene ······ *Yang Jihua* (杨继华), *Hu Jingyu* (扈晶余), *Feng Shufen* (逄束芬), *Pan Enli* (潘恩黎), *Xie Demin* (谢德民), *Zhong Chongqi* (仲崇祺) and *Ouyang Jun* (欧阳均) (734)
The Nuclear Magnetic Resonances of Carbazole Derivatives ······ *Xu Guangzhi* (徐广智), *Wang Yuzhen* (王玉珍), *Wang Zhuting* (王竹庭), *Shen Qifeng* (沈其丰) and *Tang Youqi* (唐有祺) (744)
Synthesis of Deoxyharringtonine and Separation of Its Stereomers ······ *Huang Wenkui* (黄文魁), *Li Yulin* (李裕林) and *Pan Xinfu* (潘鑫复) (835)
Graph Theory of Molecular Orbitals ——Calculation of a_N, the Determinant of Adjacent Matrix and the Stability of Molecules ······ *Jiang Yuansheng* (江元生) (847)
Quantum Theory of Chemical Reaction Rate ······ *Deng Conghao* (邓从豪) (969)
Kinetic Behaviour and Mechanism of Oxychlorination Catalyst ······ *Xie Youchang* (谢有畅), *Zhang Huixin* (张慧心) and *Wang Ronghua* (王荣华) (979)
A New Method of Calculation for Molecular Shell Model ······ *Chen Jinquan* (陈金全), *Wang Fan* (王 凡), *Gao Meijuan* (高美娟) and *Yu Zurong* (于祖荣) (1116)
Some Surface Thermodynamic Quantities for Aqueous Solutions of Aliphatic Alcohols and Fatty Acids ······ *Zhou Naifu* (周乃扶) (1128)
Photo-response Characteristics of the Junction Field Effect Transistor and Its Application in UV-detector ······ *Hui Yongzheng* (惠永正), *Shen Qi* (沈 琦), *Qian Cheng* (钱 诚) and *You Zhaolin* (尤昭麟) (1247)
Sensitization and Stabilization of Photographic Emulsions by Triazaindolizine Stabilizers ······ *Zeng Fanjie* (曾繁杰) (1258)
Determination of the Standard Enthalpy of Formation of Uranium Tetrafluoride by Solution Calorimetry ······ *Hu Riheng* (胡日恒), *Ni Xirong* (倪锡荣), *Dai Muzhang* (戴慕仉), *Liu Kuiwen* (刘奎文), *Hu Cuiqing* (胡粹青), *Shi Daojun* (石道钧), *Zhang Miagwen* (张明文) and *Huang Weijun* (黄为钧) (1386)
Reactions of Carbomethoxy-methylene-triphenylarsorane and Benzoylmethylene-triphenylarsorane With α, β-unsaturated Ketones ······ *Huang Yaozeng* (黄耀曾), *Shen Yanchang* (沈延昌), *Xin Yuankang* (忻元康) and *Ma Jingji* (马敬骥) (1396)
Microemulsion Formation in Some Extractants and Its Effects on Extraction Mechanism ······ *Wu Jinguang* (吴瑾光), *Gao Hongcheng* (高宏成), *Chen Dian* (陈 滇), *Jin Tianzhu* (金天柱), *Li Shengchohg* (李声燊) and *Xu Guangxian* (徐光宪) (1533)

Astronomy

A High Accuracy Numerical Method for Solving the Nonlinear Korteweg-De Vries Equation ······ *Chen Xiongshan* (陈雄山) (75)
On the Plasma Current Rings Model for Formation of Equatorial Belt After Nova Outburst ······ *Mo Jinger* (莫静儿), *Hang Hengrong* (杭恒荣) and *Wang Deyu* (王德焴) (202)
A Gaseous Theory of the Origin and Persistence of Galactic Spiral Structure ······ *Hu Wenrui* (胡文瑞) and *Ao Chao* (敖 超) (607)
Theoretical Analysis of Atmospheric Waves in Equatorial Zone ······ *Zhou Zidong* (周紫东), *Di Xinwu* (狄新武) and *Du Xingyuan* (杜行远) (754)
On the Origin of the Solar System ······ *Dai Wensai* (戴文赛) and *Hu Zhongwei* (胡中为) (862)
Tunnel Effect on Density Waves of Galaxies at Corotation Circle and the Switch Character of the "Waser" Mechanism ······ *Xu Jianjun* (徐建军) (992)
Turbulent Convection and Pulsational Stability of Variable Stars ······ *Xiong Darun* (熊大闰) (1139)
Hydrodynamical Theory of Three-dimensional Density Wave for Spiral Structure of Galaxies (II) ——Global Mode Solution and Effect of Thickness ······ *Xu Jianjun* (徐建军) (1545)

Earth Sciences

Topological Structures in Multisystems of $n+4$ Phases …… *Guo Qiti* (郭其悌) (88)
On the Stages of Large-scale Motion of the Atmosphere …… *Li Maicun* (李麦村) (213)
On the Miomera and Polymera (Trilobita) …… *Zhang Wentang* (张文堂) (223)
The Effects of Ice Caps-albedo Feedback on the Global Climate in Two-dimensional Energy Balance Model …… *Chao Jiping* (巢纪平) and *Chen Yingyi* (陈英仪) (319)
Megastages in the Tectonic Development of Asia …… *Wang Hongzhen* (王鸿祯) (331)
Closed-net-diagrams of Binary Six-phase ($n+4$) Multisystems …… *Guo Qiti* (郭其悌) (346)
On the Polycyclic Evolution of Geosynclinal Foldbelts …… *Huang Jiqing* (黄汲清) (475)
Stress Path, Strength and Dilatancy of Rocks …… *Chen Yong* (陈　颙), *Yao Xiaoxin* (姚孝新) and *Geng Naiguang* (耿乃光) (492)
Holocene of Beijing Region and the Changes of Its Natural Environments …… *Chen Fangji* (陈方吉) (622)
The Lepidophytic Plants of the Cathaysia Flora in Eastern Asia …… *Li Xingxue* (李星学) (634)
Wind Regime in Urban Planning and Industrial Distribution …… *Yang Wuyang* (杨吾扬) and *Dong Liming* (董黎明) (766)
Exact Solution for the System of Flow Equations Through a Medium With Double-porosity …… *Chen Zhongxiang* (陈钟祥) and *Jiang Lishang* (姜礼尚) (880)
Stochastic Model and Statistical Characteristics of Bed Load Dispersion …… *Han Qiwei* (韩其为) and *He Mingmin* (何明民) (1006)
Deformation and Metamorphic History of the Presinian Rock Groups in the Songshan Area, Henan Province, China …… *Liu Ruqi* (刘如琦), *You Zhendong* (游振东), *Suo Shutian* (索书田) and *Ma Xingyuan* (马杏垣) (1022)
Complete Systems of Closed Nets for Unary Five-phase ($n+4$) Multisystems and Their Applications to Concrete Configurations of Phase Diagrams …… *Guo Qiti* (郭其悌) (1039)
Characteristics of Inclusions in Minerals of Different Genetic Types of Granitic Rocks in SE China …… *Wang Henian* (王鹤年), *Chu Tongqing* (储同庆) and *Jiang Haoshen* (蒋浩琛) (1150)
Thermal Model of Continental Lithosphere …… *Li Yinting* (李荫亭), *Guan Dexiang* (关德相) and *Xue En* (薛　恩) (1163)
The Cnoidal Waves of Rotating Barotropic Atmosphere …… *Chao Jiping* (巢纪平) and *Huang Ruixin* (黄瑞新) (1266)
Geometry of the Diffraction in Gandolfi Camera …… *Zhang Zhenyu* (张振禹) (1278)
Formation and Migration of Continental Oil and Gas in China (I)
——A Fundamental Geological Condition for the Formation of Continental Oil and Gas …… *Fan Pu* (范　璞), *Luo Binjie* (罗斌杰), *Huang Ruchang* (黄汝昌), *Shen Ping* (沈　平), *Hui Rongyao* (惠荣耀), *Shao Hongshun* (邵宏舜), *Wang Youxiao* (王有孝) and *Rong Guanghua* (荣光华) (1286)
Numerical Experiment of Hemispheric Rotational Adaptation Process …… *Zeng Qingcun* (曾庆存), *Yuan Chongguang* (袁重光) and *Li Rongfeng* (李荣凤) (1405)
Formation and Migration of Continental Oil and Gas in China (II)
—— Evolution and Migration of Oil and Gas …… *Fan Pu* (范　璞), *Luo Binjie* (罗斌杰), *Huang Ruchang* (黄汝昌), *Shen Ping* (沈　平), *Hui Rongyao* (惠荣耀), *Shao Hongshun* (邵宏舜), *Wang Youxiao* (王有孝) and *Rong Guanghua* (荣光华) (1417)
Stress Wave, Motion of Strain Wave and Slow Earthquake …… *Lu Dajiong* (吕大炯) (1428)
Mechanisms of Migration Zoning Due to Concentration Difference of Mineral Particles and of Mineralization Enrichment in Tungsten Vein Deposits …… *Liu Zhiqing* (柳志青) (1559)
Dam-site Hydrographs Due to Sudden Release …… *Lin Bingnan* (林秉南), *Gong Zhenying* (龚振瀛) and *Wang Lianxiang* (王连祥) (1570)

Biology

Effect of *n*-Butanol on Na^+, K^+-ATPase …… *Lin Qishui* (林其谁) and *Li Yun* (李　筠) (100)
Complementation Analysis and Characterization of the Nitrogen Fixation Genes, *nifH*, *nifC* and *nifJ* in *Klebsiella pneumoniae* …… *Jin Runzhi* (金润之), *Huang Yide* (黄毅德), *Shen Meijing* (沈美静), *Chen Junbiao* (陈俊标), *Gu Dean* (顾德安), *Shen Bingfu* (沈炳福), *Li Wujun* (李武军) and *Shen Shanjiong* (沈善炯) (108)

Genetic Manipulation in Higher Organisms
III. Detection of Soya Protein in Seeds Derived From Soya mRNA-treated Rice …… *M. C. Niu* (牛满江), *Chang Pao-ying* (张葆英), *Lin Zhongping* (林忠平), *Ma Cheng* (马 诚) and *Zhang Yulian* (张玉麟) (119)
Establishment of Three Human Liver Carcinoma Cell Lines and Some of Their Biological Characteristics *in Vitro* …… *Chen Ruiming* (陈瑞铭), *Zhu Dehou* (朱德厚), *Ye Xiushen* (叶秀珍), *Shen Dingwu* (沈鼎武) and *Lu Ronghua* (陆荣华) (236)
Relationship Between Hydrogenase and Nitrogenase in Hydrogen Metabolism of Photosynthetic Bacterium *Rhodopseudomonas capsulata* …… *Song Hongyu* (宋鸿遇), *Chen Hancai* (陈汉才), *Wu Menggan* (吴梦淦), *Chen Bingjian* (陈秉俭) and *Yu Baolin* (郁宝麟) (252)
Mapping and Characterization of the *hisD*-unlinked *nif* Mutants in *Klebsiella pneumoniae* …… *Xue Zhongtian* (薛中天), *Jiang Qunyi* (江群益) and *Shen Shanjiong* (沈善炯) (261)
The Nature of the RNA Products Synthesized *in vitro* With a Cell-free Extract From TMV-infected Tobacco Leaves …… *Fang Rongxiang* (方荣祥), *Wang Xiaofeng* (王小凤), *Qin Bingyi* (覃秉益), *Cai Faxing* (蔡发兴) and *Bu Ming* (卜 明) (357)
Ultrastructure of Sperm Cell in Mature Pollen Grain of Wheat …… *Zhu Cheng* (朱 澂), *Hu Shiyi* (胡适宜), *Xu Liyun* (徐丽云), *Li Xiuru* (李秀茹) and *Shen Jiaheng* (申家恒) (371)
Analysis of the Irreversible Process of Proton Transport in the Purple Membrane of *Halobacterium Halobium* …… *Tan Hong* (谈 洪) and *Tan Manqi* (谈曼琪) (502)
Presence of Liver-forming Fraction in Fish Egg mRNAs Detected by Its Ability to Encode Albumin Synthesis …… *M. C. Niu* (牛满江), *Yu Jiankang* (于建康) and *Song Dexiu* (宋德秀) (510)
Nuclear Transplantation in Teleosts
I. Hybrid Fish From the Nucleus of Carp and the Cytoplasm of Crucian …… *Research Group of Cytogenetics, Institute of Zoology, Academia Sinica; Research Group of Somatic Cell Genetics, Institute of Hydrobiology, Academia Sinica* and *Research Group of Nuclear Transplantation, Chang Jiang Fisheries Research Institute, State Fisheries General Board* (517)
Cyanide-insensitive Respiration in Corn Mitochondria
I. Comparison Between Sensitivites of α-ketoglutarate and Succinate Oxidations to Cyanide …… *Yang Fuyu* (杨福愉), *Xing Qingru* (邢菁如) and *Wang Shuya* (王淑雅) (774)
Observations on Baiji (*Lipotes vexillifer*) and Finless Porpoise (*Neophocaena asiaeorientalis*) in the Lower Reaches of the Chang Jiang
——With Remarks on Physiological Adaptations of Baiji to the Environments …… *Zhou Kaiya* (周开亚), *Pilleri, G.* and *Li Yuemin* (李悦民) (785)
Presence of a Cytochrome b-containing Ferritin in *Azotobacter vinelandii* …… *Li Jiudi* (李久蒂), *Wang Jiwen* (王继文), *Zhong Zepu* (钟泽璞), *Tu Ya* (田 亚) and *Dong Bei* (董 北) (897)
Chromosome Variation of Pollen Mother Cell of Pollen-derived Plants in Wheat (*Triticum aestivum* L.) …… *Hu Han* (胡 含), *Xi Ziying* (郗子英), *Ouyang Junwen* (欧阳俊闻), *Hao Shui* (郝 水), *He Mengyuan* (何孟元), *Xu Zongyao* (徐宗尧) and *Zou Mingqian* (邹明谦) (905)
On the Characteristics of the Adsorption of Phosphate on Root System …… *Liu Zhiyu* (刘芷宇) and *Cao Yacheng* (曹亚澄) (1046)
Large-scale Purification of Prothoracicotropic Hormone of the Silkworm (*Bombyx Mori*) …… *Hiromichi Nagasawa* (长泽宽道), *Guo Fu* (郭 郛), *Zhong Xiangchen* (钟香臣), *Xia Bangying* (夏邦颖), *Wang Zongshun* (王宗舜), *Qiu Xujia* (仇序佳), *Wei Dingyi* (魏定义), *Chen Eying* (陈娥英), *Wang Jingze* (王敬泽), *Akinori Suzuki* (鈴木昭憲), *Akira Isogai* (磯贝彰), *Yasuhiro Hori* (堀康宏), *Saburo Tamura* (田村三郎) and *Hironori Ishizaki* (石崎宏矩) (1053)
Effect of Chronic Irradiation of ^{60}Co-γ-ray at Low Dose Rate on Rhesus Monkey (*Macaca Mulatta*) … *Cooperative Research Group of Low Dose Irradiation, Institute of Biophysics, Academia Sinica* (1170)
Elektrophysiologische Untersuchungen Zur Spektral und Polarisations-Empfindichkeit Der Sehzellen Von *Calliphora Erythrocephala* I …… *Guo Aike* (郭爱克) (1182)
A New Fluorescent Hydrazide for Sequencing Ribonucleic Acids …… *Liu Wangyi* (刘望夷), *Gu Xiangrong* (辜祥荣) and *Cai Ju'e* (蔡菊娥) (1296)
Insulins From Different Species ——Chicken and Snake …… *Cao Qiuping* (曹秋平), *Li Tongfen* (李桐芬), *Peng Xinghua* (彭兴华) and *Zhang Youshang* (张友尚) (1309)

Restriction Endonucleases From Three Strains of *Haemophilus influenzae* ……
…… *Shen Sixiang* (沈思祥), *Li Qiliang* (李其梁), *Yan Peifang* (严佩芳),
Zhou Bing (周　兵), *Ye Shengyu* (叶盛钰), *Lu Youyi* (吕幼仪) and *Wang Debao* (王德宝) (1435)
Preparations and Properties of Crystalline Porcine and Bovine $[\mathrm{Trp}]^{B_1}$ Insulins ……
…… *D. Brandenburg*, *Lei Kejian* (雷克健),
Wang Zhizhen (王志珍), *Dong Bei* (董　北), *Ru Binggen* (茹炳根) and *Zhu Shangquan* (朱尚权) (1443)
Active Products of Porcine Trypsin After Autolysis ……
…… *Ru Binggen* (茹炳根), *Du Jinzhu* (杜锦珠), *Zeng Yaohui* (曾耀辉), *Chen Liansheng* (陈濂生), *Ni Yisheng* (倪逸声), *Tan Guohua* (谭国华) and *Zhang Longxiang* (张龙翔) (1453)
Elektrophysiologische Untersuchungen zur Spektral-und Polarisationsempfindlichkeit an den Sehzellen von *Calliphora erythrocephala* II …… *Guo Aike* (郭爱克) (1461)
Effect of Modification of Cys-149 on the Ligand Binding Properties of D-glyceraldehyde-3-phosphate Dehydrogenase …… *Zhao Kangyuan* (赵康源), *Lian Yongning* (练永宁), *He Yansheng* (何燕生) and *Zou Chenglu* (邹承鲁) (1583)
Preparation and Crystallization of Des (B-chain C-terminal) Heptapeptide Insulin ……
…… *Lu Zixian* (鲁子贤)) and *Yu Ronghua* (虞荣华) (1592)

Medical Sciences

Crystal Structure and Absolute Configuration of *Qinghaosu* ……
…… *Qinghaosu Research Group, Institute of Biophysics, Academia Sinica* (880)
Antispermatogenic Effect of Gossypol on the Germinal Epithelium of the Rat Testes
——A Cytological, Autoradiographical and Ultrastructural Observation ……
…… *Xue Shepu* (薛社普), *Zong Shudong* (宗书东), *Su Shuyun* (苏树芸),
Wu Yanwan (吴燕婉), *Liu Yi* (刘　毅), *Zhou Zenghua* (周增桦) and *Ma Xixin* (马希信) (642)
Chemically-induced *in Vitro* Malignant Transformation of Human Esophagus Fibroblasts ……
…… *Wu Min* (吴　旻), *Wang Xiuqin* (王秀琴) and *Li Shende* (李申德) (658)
Development of Hypertension in Dogs Under Intensified Tension of Higher Nervous Activities ……
…… *Jin Yinchang* (金荫昌), *Zeng Guiyun* (曾贵云) and *Wang Zhong* (汪　钟) (665)
Effects of Reserpine on the Development of Neuropsychogenic Hypertension in Dogs ……
…… *Zeng Guiyun* (曾贵云), *Xie Shengyang* (谢声扬), *You Shengquan* (尤胜权) and *Jin Yinchang* (金荫昌) (796)
Female Cadaver in the Han Tomb No. 1
——X-ray Diffraction Studies on Two Kinds of Fibrous Protein ……
…… *Wu Bomu* (伍伯牧) and *Wang Jiahuai* (王家槐) (915)
Antigenic Relationship Between H1 and H2 of Influenza A Virus ……
…… *Liu Gengqi* (刘庚起), *Gong Xinchang* (龚新昌), *Zhu Jiming* (朱既明), *Ren Guifang* (任贵方), *Fan Ruilian* (范瑞莲) and *Ruan Weiqin* (阮蔚琴) (1061)
Enkephalin Involvement in Acupuncture Analgesia-radioimmunoassay …… *Zou Gang* (邹　冈), *Yi Qingcheng* (易庆成), *Wu Shixiang* (吴时祥), *Lu Yixin* (陆以信), *Wang Fansheng* (汪范生), *Yu Yuegui* (俞月桂), *Ji Xinquan* (季新泉), *Zhang Zuxuan* (张祖煊) and *Zhao Dandan* (赵丹丹) (1197)
Studies on the Ultrastructure of Envelope of Elementary Bodies of *Chlamydia Trachomatis* ……
…… *Zhang Youxun* (张友逊),
Meng Xianmin (孟宪敏), *Zhang Lihua* (张利华), *Su Hua* (苏　华) and *Li Rongde* (李荣德) (1208)
Electrocardiogram Made on Ascending the Mount Qomolangma From 50 m a. s. l. ……
Shi Zhongyuan (石中瑗) *Ning Xuehan* (宁学寒), *Zhu Shoucheng* (朱受成), *Zhao Deming* (赵德铭),
Huang Pengguo (黄彭国), *Yang Shengyue* (杨生岳), *Wang Yan* (王　燕) and *Dong Zhaoshen* (董兆申) (1316)
Bioelectrical Information Processing
——The Body-surface HBE …… *Wang Xiangsheng* (王湘生) (1469)
Correlation Technique and Its Application in the His Bundle Electrocardiogram ……
…… *Wang Xiangsheng* (王湘生) (1599)

Technological Sciences

A Theoretical and Experimental Study of Split-folded Waveguide Slow-wave Structure ········ *Wang Zuqi* (王祖耆), *Xia Shirong* (夏世荣), *Hou Luying* (侯露莹), *Wang Zhiyu* (王志玉) and *Gu Maozhang* (顾茂章) (124)
The Optimization Design Theory of Electrohydraulic Loading System ········ *Liu Changnian* (刘长年) (397)
Analysis of the Sediment Deposition in Density Currents ········ *Fan Jiahua* (范家骅) (526)
The Optimal Fast Turbine Valve Control and Its Experimental Research on Micro-alternator System ········ *Lu Qiang* (卢　强), *Wang Zonghong* (王仲鸿) and *Han Yingduo* (韩英铎) (923)
The Relation Between Crack Opening Displacement and Strain ········ *Qi Jingtai* (齐景泰) and *Cai Shutang* (蔡树棠) (1326)
Variational Principles and Generalized Variational Principles for the Hybrid Aerodynamic Problem of Airfoil Cascades on an Arbitrary Stream Sheet of Revolution ········ *Liu Gaolian* (刘高联) (1339)
Ultrahigh Speed Hardware Algorithm for Radix Two Multi-digit Addition and Its Potential Applications ········ *Luo Peilin* (罗沛霖) and *Wang Gongben* (王攻本) (1348)
A Precise Determination of the Emf-temperature Coefficient of the Saturated Standard Cells ········ *Experimental Group of Emf-temperature Formula for Saturated Standard Cells* (1481)
A Software Engineering View in Researching Data Base Management
—DBM Extension of Hierarchical Languages Family XYZ ········ *Zhou Longxiang* (周龙骧) (1608)

Index to 'SCIENCE BULLETIN'

Beijing KEXUE TONGBAO in English Vol 25 No 12, Dec 80 pp i-x

[Following is index arranged by broad category of Chinese scientific journal KEXUE TONGBAO [SCIENCE BULLETIN] for calendar year 1980]

[Text]

Mathematics

On the Transcendence of a Class of Series
—An Application of W. M. Schmidt's Theorem ········ *Zhu Yaochen* (朱尧辰), *Wang Lianxiang* (王连祥) and *Xu Guangshan* (徐广善) (1)
On Estimates of Correlation Functions for a Kind of Binary Sequences ········ *Chen Wende* (陈文德) (7)
On Lacunary Interpolation Spline of C^1-Class ········ *Chen Tianping* (陈天平) (13)
Approximation and Expansion by Rational Functions in Contain Class of Domains ········ *Shen Xiechang* (沈燮昌) (97)
Coefficient Problems of Holomorphic Mappings on Reinhardt Domains ········ *Zhang Jinhao* (张锦豪) (103)
Spherical Summability of Multiple Fourier Series and Conjugate Fourier Integrals ········ *Lu Shanzhen* (陆善镇) (108)
On Calculability of I^*-measure With Respect to Complex-union and Other Related Constructions ········ *Wu Wenjun* (吴文俊) (185)
On Approximation of Differentiable Function by Fourier Sums ········ *Xie Tingfan* (谢庭藩) (189)
On Equations of Yang-Mills Gauge Fields With Mass ········ *Hu Hesheng* (胡和生) (191)
Generalized Principle of Inclusion and Exclusion and Its Applications ········ *Wei Wandi* (魏万迪) (196)
Qualitative Investigation of the Differential Equation of Brusslator in Biochemistry ········ *Qin Yuanxun* (秦元勋) and *Zeng Xianwu* (曾宪武) (273)
Coefficients of Inverses of Meromorphic Univalent Functions ········ *Ren Fuyao* (任福尧) (277)
Boundary Value Problems With Three-characteristic Supports for Linear Totally Hyperbolic Equation of the Third Order ········ *Ni Xingtang* (倪星棠) (361)
A Class of Continuous Functions II ········ *Liu Wen* (刘　文) (370)
Lower Bound for Zeros of Riemann's Zeta Function on $\sigma = 1/2$ ········ *Lou Shituo* (楼世拓) and *Yao Qi* (姚　琦) (374)

Modified Dirichlet Problem and Quasiconformal Mappings for Nonlinear Elliptic Systems of First Order ······ *Wen Guochun* (闻国椿) (449)
Products of x^{+}_{1} and x^{+}_{n} ······ *Li Yaching* (李雅卿) (454)
Unitary Dilation of an Operator ······ *Yan Shaozong* (严绍宗) (462)
Decay of Solutions of a Conservation Law ······ *Wang Jinghua* (王靖华) (537)
On a Class of Diophantine Equations ······ *Yan Faxiang* (阎发湘) (543)
On the Distribution of the Values of Meromorphic Functions ······ *Zhuang Qitai* (庄圻泰) (625)
A Class of Continuous Functions III ······ *Liu Wen* (刘　文) (631)
An Inequality in Theory of Optimum Search Trees ······ *Tu Guihong* (屠规彰) (713)
Static Solutions of Yang-Mills-Higgs-Kibble Systems ······ *S. Deser* and *C. J. Isham* (716)
A Parametric Representation of Quasi-Conformal Extensions ······ *He Chengqi* (何成奇) (721)
On Diophantine Inequality Involving a Class of *G*-Functions in *p*-adic Form ······ *Wang Lianxiang* (王连祥) and *Xu Guangshan* (徐广善) (801)
Markov Processes and Field Theory ······ *Hou Zhenting* (侯振挺) and *Chen Mufa* (陈木法) (807)
A Simple Method of Sequential Circuit Synthesis ······ *Zeng Guangtong* (曾光橦) (889)
Answers to Some Questions on Topological Dynamical Systems Posed by Nemytskii ······ *Zhang Zhifen* (张芷芬), *Ding Tongren* (丁同仁) and *Huang Wenzao* (黄文灶) (895)
On the Distortion Theorem of Schlicht Functions ······ *Hu Ke* (胡　克) (977)
Trace Theorems of the Spaces $W^{1}L_{p}(\phi,\Omega)$ and Calculus of Variations With Strong Nonlenearity ······ *Ding Xiaxi* (丁夏畦), *Luo Peizhu* (罗佩珠), *Fang Huizhong* (方惠中) and *Gu Yonggeng* (顾永耕) (981)

Physics

Nonlinear Liquid Crystals ······ *Liu Jiagang* (刘家冈) and *Lin Lei* (林　磊) (17)
Electro-Weak Theory in *SU* (3) ······ *Zhou Guangzhao* (周光召) and *Gao Chongshou* (高崇寿) (21)
Vacuum Spontaneously Broken Symmetry of Higgs Field and Bose Condensation ······ *Ni Guangjiong* (倪光炯) and *Su Rukeng* (苏汝铿) (26)
UMVUE of Two-sided Truncation Parameters ······ *Lu Kunliang* (卢昆亮) and *Zhao Lincheng* (赵林城) (113)
An Expression of Symplectic Matrices as a Product of Symplectic Transvections ······ *Liu Changan* (刘长安) (116)
Intermediate Vector Particle Model of the Processes Forbidden by Zweig Rule ······ *Qin Danhua* (秦旦华) and *Gao Chongshou* (高崇寿) (122)
Equations of Motion for a Spinning Particle in Gravitational Field With Torsion ······ *Wu Yongshi* (吴咏时) and *Liu Yufen* (刘煜奋) (127)
Irreducible Representations of Graded Lie Algebra *SU* (2/1) ······ *Song Xingchang* (宋行长), *Han Qizhi* (韩其智) and *Sun Hongzhou* (孙洪洲) (201)
Motion of Particles Suspended in Stationary Turbulent Medium at Large Reynolds Number ······ *Li Yinting* (李荫亭) and *Guan Dexiang* (关德相) (281)
A Generalized Unified Theory of Weak Interactions and Electromagnetism ······ *Luo Liaofu* (罗辽复) (286)
Effect of Transmission of Pulsed High-power 10.6μm Laser on Atmosphere ······ *Gong Zhiben* (龚知本) (466)
Anomalous Properties of $LiNbO_3$ Crystal Near 75℃ ······ *Xu Ziran* (许自然), *Sheng Huimin* (沈惠敏) and *Wang Yening* (王业宁) (547)
The Rate-determining Factor of Electrophilic Addition Reactions to Non-conjugated Olefins ······ *Zhang Jiancheng* (张建成), *Liu Xinhou* (刘新厚) and *Liu Ruozhuang* (刘若庄) (553)
Disorder Parameter and Duality ······ *Zhou Guangzhao* (周光召) and *Xian Dingchang* (冼鼎昌) (635)
The Physical Basis of Nonequilibrium Order ······ *Huang Huici* (黄惠慈) (640)
A Closed Form for the Series Formula of the Superconducting Critical Temperature ······ *Cai Jianhua* (蔡建华) (725)
Random Systems With Inhomogeneous Concentration ······ *Zhang Zhaoqing* (张昭庆) (816)
Structure Function of Pion in a Covariant Parton Model ······ *Zhao Wanyun* (赵万云) (821)

Ti-Diffused $LiNbO_3$ Optical Waveguides With Low Loss ··· *Li Yushen* (李玉善), *Liu Hongju* (刘洪举), *Ren Bingfu* (任秉复) and *Yu Rongjin* (于荣金) (824)
Influence of Perturbed Gravitational Field on Galactic Shock Wave ··· *Hu Wenrui* (胡文瑞) (900)
Experiment on the Acoustic Radiation Effect of Electron Beams ··· *Sung Jianning* (宋建宁), *Jian Yinlin* (姜印琳) and *Huo Anxiang* (霍安祥) (906)
Recommendation and Reference Table of Rigid Elliptical Waveguide Data ··· *Lin Weigan* (林为干) (985)
Backward-Wave Parametric Oscillation by Degenerate Four-Wave Mixing ··· *Wu Cunkai* (吴存恺), *Fan Junyin* (范俊颖), *Wang Zhiying* (王志英), *Fan Chikang* (范滋康), *Mao Weimin* (毛为民) and *Liu Yueying* (柳月英) (988)
A Check on Individual Terms of Nuclear Mass Formula ··· *Zeng Jinyan* (曾谨言), *Lin Chunzhen* (林纯镇) and *Yang Fujia* (杨福家) (992)
Laser Interferometric Measurements of Very Small Vibration Amplitudes of the Order of Angstroms and Its Applications ··· *Dong Xianquan* (董显铨), *Yu Zhongmin* (于仲敏) and *Li Wenlong* (李文龙) (1036)

Chemistry

Measurement of Local Convective Heat Transfer Coefficient for Plate Calorimeter by Polarization Interferometer ··· *Tan Hong* (谈 洪) and *Yan Mingshan* (阎明山) (31)
Application of the "Inclined *W* Hypothesis" to Catalytic Properties of Rare Earths ··· *Wu Yue* (吴 越) (37)
Study of Some 2,4-disubstituted-2, 3-dihydrobenzo-(1,5) Thiazepines and the Structures of Their Intermediates ··· *Jin Sheng* (金 声) aud *Xing Qiyi* (邢其毅) (41)
Studies on Organometallic Compounds of Titanium, Zirconium and Hafnium ··· *Chen Shoushan* (陈寿山), *Liu Yiyin* (刘以寅), *Xuan Zhenai* (玄镇爱) and *Zhang Zhengzhi* (张正之) (44)
Morphology and Misfit of Growth Striae on Boundaries of Facetted and Non-facetted Growth Sections in Czochralski Grown $LiNbO_3$ Single Crystals ··· *Min Naiben* (闵乃本), *Hong Jingfen* (洪静芬) and *Feng Duan* (冯 端) (134)
High Resolution Parallel Plate Electron Multiplier ··· *Yu Xiangrung* (*Yu Hsiang-jung* 郁向荣) (138)
Alkaloids of Sha Beimu Identified as *Fritillaria Karelinii* (fisch) Baker ··· *Pan Xinfu* (潘鑫复) and *Zhu Ziqing* (*T. T. Chu* 朱子清) (143)
BPR Study of Electron Transfer Between Quinones and Copper (II)-Pyridine Complex ··· *Wang Hanqing* (汪汉卿), *Feng Liangpo* (冯良波) and *Chen Yingwu* (陈英武) (145)
Synthesis and Polymerization of γ-alkoxy β-hydroxypropyl Acrylates ··· *Lu Chengxun* (陆承勋), *Chen Naichun* (陈乃春), *Gu Zhongwei* (顾忠伟) and *Feng Xinde* (冯新德) (149)
Linear Correlation Between *T*-value and Number of 4*f* Electrons in the Calculation of Lanthanides' Ionization Potential ··· *Liu Qingliang* (刘清亮) (154)
Analysis for Minor Isotopes Deuterium and Oxygen-18 in Natural Waters ··· *Zhang Quinglian* (张青莲) (208)
Surface State of Zinc Electrode in Alkaline Solution ··· *Gu Linying* (谷林瑛) and *Wang Jiaqi* (王嘉琪) (213)
Studies on Oxidation and Polymerization of Acrylic Esters in the Presence of Amine ··· *Cao Weixiao* (曹维孝) and *Feng Xinde* (冯新德) (217)
Catalytic Decomposition of Trichloroacetic Acid ··· *Guo Zhengyi* (郭正谊), *Chen Zhilin* (陈致林) and *Mao Zhihua* (毛志华) (224)
Statistical Analysis of Coprecipitate Ions and Carriers in Analytical Chemistry ··· *Hu Zhide* (胡之德) (292)
Electronic Structure of Alkali-metal Complex of Crown Ether 12-C-4 ··· *You Xiaozeng* (游效曾), *Li Zhongde* (李重德), *Yu Yaohua* (余耀华) and *Bao Jiawei* (包家伟) (296)
Crystal and Molecular Structure of Bis- (1-diethylphosphino-2-diphenylphosphino Ethane)-Bis (Dinitrogen) Molybdenum (0) ··· *Xia Zongxiang* (夏宗芗), *Ni Chaozhou* (倪朝周), *Ma Yilin* (马益林) and *Zhang Zhiming* (张志明) (300)

Improvement on Slater's Atomic Orbitals Calculation …… *Chen Nianyi* (陈念贻) and *Wen Yuankai* (温元凯) (395)
Studies on Spectrophotometric Determination of Trace Phosphine With Silver Diethyl Dithiocarbamate (Ag-DDC) as Reagent …… *Hu Weiwang* (胡慰望) and *Xie Bijun* (谢笔钧) (402)
Complex Mechanism of Excitation of Semiconductor Catalytic Kinetics (II)
Some Results on Constant State …… *Wu Xichuan* (吴希权) (409)
Study on Synthesis and Properties of Solid State Complex of Ce (IV) With Dibenzo-18-Crown-6 …… *Tan Minyu* (谭民裕) and *Gao Yici* (高亿慈) (482)
Complexing of AU (I) With Thiourea Studied by Potentiometric Method …… *Zhang Jianmin* (章健民), *Zhang Jixian* (张继先), *Liu Guohui* (刘国辉), *Xiong Bilin* (熊必琳), *Yang Bingyu* (杨丙雨), *Liu Chuansheng* (刘传胜), *Xu Cunsheng* (徐存生), *Yang Wentai* (杨文泰), *Wu Wenbin* (邬文斌) and *Wang Yufeng* (王玉峰) (558)
Studies on Chemically Induced Stepping Automatism in Guinea Pigs …… *Liu Shiyi* (刘世熠), *Zhang Wenyuan* (张文远), *Dai Xiuju* (戴琇菊) and *Wang Zesheng* (王泽生) (562)
CNDO/2 Calculations of Protonated Complexes of Isobutene and Formaldehyde Over Solid Acidic Catalyst …… *Wang Hanqing* (汪汉卿), *Chen Zhiwen* (陈治文) and *Chen Yingwu* (陈英武) (566)
Interferences of Molecular Absorption of SrOH and CaOH in Acetylene-Air Flames and Optimization of Measuring Conditions for the Atomic Absorption of Lithium and Barium …… *Hu Feng* (胡　丰), *Wang Ruiling* (王瑞陵) and *Liu Qunzhu* (刘群柱) (578)
Studies on Oxidation and Polymerization of Acrylic Esters in the Presence of Phenyl Hydrazine …… *Cao Weixiao* (曹维孝) and *Feng Xinde* (冯新德) (647)
Symmetry Division of Molecular Orbital Graph by Image-graphical Method …… *Zhao Honggang* (赵洪刚), *Chen Lianshan* (陈连山), *He Zhonglin* (何钟林) and *Chang Mian* (常　棉) (652)
Crystal Structure of Chuangxinmycin …… *Xu Xiaojie* (徐筱杰), *Shao Meicheng* (邵美成), *Zhang Zeying* (张泽莹), *Li Genpei* (李根培), *Zhou Gongdu* (周公度) and *Tang Youqi* (唐有祺) (666)
Ionic Polarization and the Calculation of Standard Electrode Potentials of Elements …… *Zhou Zhihua* (周志华) and *Wen Yuankai* (温元凯) (731)
Studies on Bioactive Acrylic Esters II
——Synthesis and Polymerization of 3-Acrylato-4-OXO-3, 4 -Dihydro-1, 2, 3-Benzotriazines …… *Lu Chengxun* (陆承勋), *Qu Linian* (屈立年) and *Feng Xinde* (冯新德) (737)
Asymmetric Reduction of Steroid Intermediate by Microorganism ……
A Study on Permeability of the Positive Image Receiving Layer …… *Zheng Deshui* (郑德水), *Ji Suxue* (季素雪), *Chen Ping* (陈　萍) and *Bai Qun* (白　群) (829)
Synthesis and Properties of Zeolite Molecular Sieve Omega …… *Xu Qinhua* (须沁华), *Zhang Huishu* (章蕙珠), *Dong Jialu* (董家騄) and *Wang Rui* (王　瑞) (833)
Synthesis of Liquid Crystals Containing Oxazole Ring …… *Li Tingshu* (李廷书) and *Dai Qianhuan* (戴乾圜) (838)
Determination of X-Ray Powder Diffraction Data of $LiTaO_3$ …… *Guo Changlin* (郭常霖) (856)
RE Perofskite Catalysts for Oxidation of Carbon Monoxide …… *Wang Qiwu* (王其武), *Rong Jingfang* (戎晶芳), *Lin Peiyan* (林培琰) and *Shan Shaochun* (单绍纯) (907)
Tetrad Effect in Solvent Extraction of Lanthanides by 2-ethylhexyl Phosphonic Acid Mono 2-Ethylhexyl Ester …… *Ma Enxin* (马恩新), *Yan Xiaomin* (严小敏), *Wang Guoliang* (王国梁) and *Yuan Chengye* (袁承业) (911)
One-Step Preparation of Spherical Polyvinyl Alcohol Carrier …… *Li Fumian* (李福绵), *Zhao Ping* (赵　萍), *Feng Xinde* (冯新德), *Li Dechang* (李德昌) and *Li Lijuan* (李丽娟) (916)
Synthesis of Bis (1-Diethylphosphinyl-2-Diphenylphosphinyl-Ethane) Bis (Dinitrogen) Molybdenum (O), $Mo(N_2)_2(Et_2PCH_2\text{-}CH_2PPh_2)_2$ …… *Chen Jiabi* (陈家璧), *Lei Guixin* (雷桂馨) and *Lu Xiyan* (陆熙炎) (919)
Bond Parametric Method Applied to Bio-inorganic Chemistry …… *Chen Nianyi* (陈念贻) and *Zhou Guocheng* (周国城) (937)
Nature of Resonance in Chemistry and Principle of Bond Type Variation …… *Tang Youqi* (唐有祺) (997)
Comments on the "ABT-Concept" …… *Wu Ningsheng* (吴宁生) (1002)

Astronomy

On Accreting Black Hole Model of SS433 ······················ *Fang Lizhi* (方励之) and *Remo Ruffini* (47)

Gravitational Instability of Loosely Wound Spiral Density Wave of Galaxies ································
——An Investigation Into Stellar Dynamics ······································ *Xu Jianjun* (徐建军) (50)

Some Remarks About Large-scale Spiral Waves in Solar Wind ··
································ *Fang Lizhi* (方励之), *Hu Youqiu* (胡友秋) and *Wang Shui* (王　水) (227)

Probable Mechanism of Electron Acceleration in Supernova Remnants··································
···································· *Yin Qifeng* (尹其丰), *Ma Er* (马　珥) and *Chen Bingqian* (陈秉乾) (237)

Equivalent Diffusion Coefficients of Solar Cosmic Rays ························ *Zhang Gongliang* (章公亮) (391)

Statistical Model of Quasi-equilibrium State for the System of Galaxies ································
·· *Liu Yongzhen* (刘永镇) and *Xu Chongming* (须重明) (575)

A Possible Interpretation of Retard Evolutions of Solar Active Regions ································
·· *Yin Qifeng* (尹其丰) and *Fand Lizhi* (方励之) (656)

······················ *Zhou Weishan* (黄维善), *Huang Dazhong* (黄大中) and *Wang Zhongqi* (王钟歆) (741)

The Hubble Diagram of QSOs by Statistical Method ························ *Cao Shenglin* (曹盛林), *Xiao Xinghua* (肖兴华), *Liu Yongzhen* (刘永镇), *Cheng Fuzhen* (程福臻) and *Yang Lantian* (杨兰田) (743)

On Approximate Analytical Solutions of Poisson Equation for Inner Region of Galaxy Disk With Finite Thickness ·· *Xu Jianjun* (徐建军) (748)

On the Origin of Redshift of Interaction of Electromagnetic Wave With Free Electron ··················
·· *Zheng Yijia* (郑怡嘉) (846)

"Abnormal" Temperature Profile Solutions of Accretion Disc Around Black Holes ························
···························· *Fang Lizhi* (方励之), *Zhang Jialü* (张家铝) and *Jiang Shuding* (江书定) (851)

1978 Data on Proton Flare Prediction by Means of Spiral Spots ······································ *Ding Youji* (丁有济), *Luo Baorong* (罗葆荣), *Zhang Bairong* (张柏荣) and *Li Weibao* (李维宝) (928)

Theoretical Calculation of Force Constants and Normal Frequencies for CO_2 Molecules ··················
·· *Zhang Benzhi* (张本志) and *Shi Guangyu* (石广玉) (1014)

A Possible Scheme for Improving Vertical Resolution and Accuracy of Satellite Temperature Retrieval
·· *Zhao Gaoxiang* (赵高祥) (1018)

Earth Sciences

A Preliminary Investigation of Cyclonic Eddy in North East China Sea in Summer ························
························ *Hu Dunxin* (胡敦欣), *Ding Zongxin* (丁宗信) and *Xiong Qingcheng* (熊庆成) (57)

Study on Thermoluminescence of Jilin Shower Meteors ··
······························ *Pei Jingxian* (裴静娴), *Wang Zaizhong* (王在中) and *Li Jiliang* (李继亮) (61)

Statistical Theory of Sediment Transport ·············· *Han Qiwei* (韩其为) and *He Mingmin* (何明民) (89)

A Study of Coastal Upwelling off SE China ························ *Hu Dunxin* (胡敦欣), *Lu Lianghong* (吕良洪), *Xiong Qingcheng* (熊庆成), *Ding Zongxin* (丁宗信) and *Sun Shouchang* (孙寿昌) (159)

Relationship Between Earth's Orbit and Climatic Changes ······························ *Xu Qinqi* (徐钦琦) (164)

A New Classification of Mineral Resources of the Sea ······························ *Zhu Erqin* (朱而勤) (168)

A Preliminary Study of Pleistocene Ostracoda From Middle and Lower Sangan River Valley ········
·· *Huang Baoren* (黄宝仁) (233)

Chenier Ridges on the West Coast of the Bohai Bay ···
Zhao Xitao (赵希涛), *Zhang Jingwen* (张景文), *Jiao Wenqiang* (焦文强) and *Li Guiying* (李桂英) (243)

An Analytical Formula for Calculating Water Hammer in Conduit of Hydraulic Turbine ··············
·· *Duan Changguo* (段昌国) (248)

Quaternary Strata and Palaeoclimate in Shanghai Region ··
Zhu Shuzhen (竹淑贞), *Chen Yeyu* (陈业裕), *Sun Yongfu* (孙永福) and *Xu Yaoting* (徐耀庭) (307)

Preparations in Analysis of Sedimentary Rock and Fossil Specimens by Electron Microscope ··········
································ *Li Mao* (李　懋), *Sun Fengyu* (孙逢育) and *Yu Congliu* (俞从流) (313)

Research of Inclosure Radioactivity and Its Importance in Prospecting ……
…… *Shan Lin* (单　林) and *Zhang Wenzhi* (张文智) (318)
Discovery of Benstonite in China …… *Gao Desheng* (高德生) (323)
Application of Sodar Data in Weather Analysis and Local Weather Forecasting ……
…… *Zhou Mingyu* (周明煜), *Lü Naiping* (吕乃平) and *Qu Shaohou* (曲绍厚) (328)
Distribution of Tritium in Natural Water in China ……
Wei Keqin (卫克勤), *Lin Ruifen* (林瑞芬), *Wang Zhixiang* (王志祥) and *Zhou Xiuyun* (周秀云) (337)
A Study of Heat Balance at the Earth's Surface Over Qinghai-Xizang Plateau ……
…… *Kou Youguan* (寇有观) (343)
Effect of Motions of Planets on Climatic Changes in China ……
…… *Ren Zhenqiu* (任振球) and *Li Zhisen* (李致森) (417)
Discovery of the Attapulgite Clay in Liuhe County, Jiangsu Province ……
…… *Xu Jiquan* (许冀泉), *Fang Yesen* (方邺森) and *Li Liwen* (李立文) (423)
Clinochalcomenite, a New Mineral of Selenite ……
…… *Lo Keding* (雒克定), *Wei Jun* (魏　均), *Zhang Jingyi* (张静宜) and *Gu Qifang* (顾琦芳) (427)
On Chinese Trihydrate-type Bauxite of Sulphide Weathering Genesis …… *Liu Changling* (刘长龄) (434)
Fluid Description of Solar Wind Plasma …… *Zhao Xuepu* (赵学溥) (488)
Geological Model of Tectonic Stress Metamorphism of Coal …… *Miao Fen* (缪　奋) (493)
Winter Temperature Changes During the Last 500 Years in South China …… *Zhang Deer* (张德二) (497)
The Information Formula of Normal Equal Correlation Factor …… *Zhang Xuewen* (张学文) (501)
Thermal State of the Tanggula Region …… *Lu Longhua* (陆龙骅) and *Dai Jiaxi* (戴加洗) (505)
A New Mineral—Ashanite $(Nb, Ta, U, Fe, Mn)_4O_8$ ……
…… *Zhang Rubo* (张如柏), *Tian Huixin* (田蕙新), *Peng Zhizhong* (彭志忠), *Ma Zhesheng* (马喆生), *Han Fengmin* (韩凤鸣) and *Jing Zebei* (景泽被) (510)
A New Interpretation of the Yuemengou Group of North China …… *Zhang Shouxin* (张守信) (515)
Pollen Analysis and Geological Age of the Nihewan Formation …… *Liu Jinling* (刘金陵) (584)
A Preliminary Study of REE Distribution in Kirin Meteorite and Its Chondrules ……
…… *Zong Puhe* (宗普和) (588)
Uranothorite Discovered in Rare Earth, Niobium, Iron Deposits at Bayan Obo, Inner Mongolia, China
…… *Yang Minzhi* (杨敏之) and *Li Yongchun* (李永春) (594)
Microstructures of Loess Soils in China …… *Gao Guorui* (高国瑞) and *Gao Guoyou* (高国猷) (597)
Types of Intercellular Junction in the Neurohypophysis ……
…… *Zhang Renji* (张人骥), *Zhu Lixia* (朱丽霞) and *Cheng Huiwen* (程会文) (602)
A Preliminary Study of Climatic Effect of the Transfer of Water of the Yangtze River to North China for Irrigation ……
…… *Li Hongzhou* (李鸿洲), *Chen Zhongzhou* (陈章昭) and *Zeng Zhaomei* (曾昭美) (660)
Topoclimate of Xishuangbanna and Cold Damage to Rubber Trees ……
…… *Wang Ling* (王　菱), *Yang Chaowu* (杨超武) and *Jiang Ailiang* (江爱良) (672)
Fuzzy Partition of Weather Processes …… *Cao Hongxing* (曹鸿兴) and *Chen Guofan* (陈国范) (678)
Thermodynamical Effects on the Qinghai-Xizang Plateau From the Radiation Balance and Heat Balance of the Earth's Surface …… *Zeng Qunzhu* (曾群柱) and *Xie Yingqin* (谢应钦) (683)
The Mesozoic Erathem on the West Side of Weishan Lake, Jiangsu Province ……
…… *Wang Rennong* (王仁农) (689)
Effect of Solar Radiation of Climatic Variation …… *Fu Yixian* (付逸贤) (695)
Preliminary Study on Some Characteristic Features of Periglacial Phenomena of Qinghai-Xizang Plateau
…… *Cui Zhijiu* (崔之久) (700)
Seismomagnetic Effect of Tangshan Earthquake ……
…… *Li Cunti* (李存悌), *Zheng Xiangyuan* (郑香媛) and *Deng Shunxing* (邓顺兴) (755)
The Relationship Between Height and Temperature of Ice Crystallization in Cumulus Clouds in Jiujiang Area …… *Jiang Zufan* (江祖凡) and *Li Taifeng* (李太丰) (760)
New Middle Triassic Notostraca (Crustacea) From Toksun County, North Xinjiang ……
…… *Hong Youchong* (洪友崇) (763)

Transmission Electron Microscopy of the Jilin (Kirin) Meteorite ························
Zhang Peishan (张培善), *Tou Kejie* (陶克捷), *Yang Dayu* (杨大宇) and *Chen Xicheng* (陈希成) (767)

Fission Track Dating of Peking Man ························ *Guo Shilun* (郭士伦), *Zhou Shuhua* (周书华),
Meng Wu (孟　武), *Zhang Pengfa* (张鹏发), *Sun Shengfen* (孙盛芬), *Hao Xiuhong* (郝秀红),
Liu Shunsheng (刘顺生), *Zhang Feng* (张　峰), *Hu Ruiying* (胡瑞英) and *Liu Jingfa* (刘京发) (770)

Quartz-Almandine Eulitite
——A Particular Metamorphic Rock ························ *Zhang Ruyuan* (张儒瑗),
Cong Bolin (从柏林), *Li Jiliang* (李继亮), *Ying Yupu* (应育浦) and *Wang Kaiyi* (王凯怡) (854)

Zeeman Splittimg in Mössbauer Spectra of Laihunite at Low Temperature ························
························ *Kan Xuemin* (阚学敏), *Zhang Enlin* (张恩林) and *Li Yirong* (李宜荣) (858)

Precambrian Spheroidal Unicells Showing Pseudo-Organelles ················ *Zhang Zhongying* (张忠英) (862)

Characters and Environmental Significance of Sinian Cryptalgal Carbonate Rocks in South China ······
························ *Tang Tianfu* (唐天福), *Xue Yaosong* (薛耀松) and *Yu Congliu* (俞从流) (866)

A Statistical-dynamic Prediction SD_{71} for Typhoon Movement in the North Western Pacific Ocean
························ *Wu Zhonghai* (吴中海) and *Xu Shaopu* (许绍溥) (923)

Permo-carboniferous Flora of Tianshan-Xingan Foldbelt ························ *Huang Benhong* (黄本宏) (933)

Studies on Snow Depth and Snow Runoff With Images From NOAA-5 Satellite ················ *Zhang
Shunying* (张顺英), *Zeng Qunzhu* (曾群柱), *Chen Xianzhang* (陈贤章) and *Jin Dehong* (金德洪) (942)

Subaqueous Alluvial Fans in Lake Basins ——A New Realm of Research for Fossil Fuels ················
Sun Yongchuan (孙永传), *Zheng Junmao* (郑浚茂), *Wang Defa* (王德发) and *Li Huisheng* (李惠生) (947)

Relation Between the Number of Invariant Points in Closed Nets and the Number of Phases for
Unary $n+k$ Phase Multisystems and the Proof of Kujawa's Empirical Formulae ················
························ *Guo Qiti* (郭其悌) and *Jin Guantao* (金观涛) (959)

A Split Method to Solve Equations of Weather Predication ························
························ *Zeng Qingcun* (曾庆存) and *Yuan Chongguang* (袁重光) (1005)

Characteristics of Northeast China Cold Summer and Global Air Temperature ························
························ *Zhang Mingli* (章民立), *Fu Congbin* (符淙斌), *Zeng Zhaomei* (曾昭美), *Peng
Xiaoxia* (彭小峡), *Guo Jialin* (郭家林), *Dong Hongnian* (董洪年) and *Yu Tongjiang* (于通江) (1010)

Discovery of the Lower Tertiary Reef Limestone in the Northern Part of East China and Its Significance in Petroleum Geology ························
··· *Qian Kai* (钱　凯), *Wang Sumin* (王素民), *Liu Shufan* (刘淑范) and *Shi Huaxing* (时华星) (1024)

An Investigation of the Stress Field in the Earth's Crust ························
························ *Zhang Zhili* (张之立) and *Liu Xinmei* (刘新美) (1029)

Biology

Toxicity and Clinical Studies on Poly (I): Poly (C) ························
························ PIC *Research Cooperation Group* (66)

An Investigation on L-tyrosine Crystal From Mawangdue Tomb No. 1 of Han Dynasty in Changsha
························ *Ding Kuishou* (丁奎首) (173)

Enucleation of Human Liver Carcinoma (BEI-7404 Line) Cells *in Vitro* by Colchicine ················
························ *Shen Dingwu* (沈鼎武), *Yang Zhenghung* (杨正洪) and *Chen Ruiming* (陈瑞铭) (356)

Monolayer Culture of Larval Hemocytes of Cotton Bollworm, *Heliothis Armigera* Hübn ················
························ *Xie Tienen* (谢天恩), *Lan
Pinzhang* (兰萍章), *Zhang Guangyu* (张光裕), *Liu Jun* (刘　军) and *Wang Luming* (王录明) (442)

Spectral Characterization of Microsomal Cytochrome p-450 From Parasite Fly *Blepharipa Tibialis*
Chao ························ *Zou
Baixiang* (邹柏祥), *Lin Hao* (林　浩), *Wang Zhongshan* (王仲山) and *Xu Tingsen* (许廷森) (520)

Synthesis of 3′-Half Molecule (Nucleotides 36—76) of Yeast Alanine Transfer RNA ················
························ *Collaboration Group of Nucleic Acid Synthesis* (525)

Agavain-SH, a Newly Discovered Sulfhydryl Protease in the *Agave Hybrid* No. 11648 ················
························ *Sun Chongrong* (孙崇荣), *Chai Changxing* (柴常星), *Fang Shengao* (方深高),
Sun Xueying (孙雪英), *Shen Jiabai* (沈家柏), *Yie Qiteng* (叶启腾) and *Cai Huadi* (蔡华娣) (528)

Stem Segment Culture in *Vitro* of *Chamaecereus Silvestrii* Br. et R. …… *Gui Yaolin* (桂耀林) and *Xu Minsheng* (徐民生) (706)
A Study on Formation of Bast Fibers in the Stem of *Apocynum Lancifolium* Rus …… *Hu Zhenghai* (胡正海) and *Tien Lanxing* (田兰馨) (773)
Effect of Mg^{2+} on Reconstitution of H^+-ATP... of Pig Heart Mitochondria Into Liposomes …… *Yang Fuyu* (杨福愉), *Guo Beiqi* (郭倍奇), *Huang Yuguo* (黄有国) and *Che Yanwu* (车延武) (779)
Isolation of Purple Membrane From Halobacterium …… *Li Shujun* (李淑俊), *Cai Jianping* (蔡剑萍), *Xiao Jianping* (肖建平), *Xu Yanan* (徐亚南) and *Wang Guoqiang* (王国强) (782)
Chloral Pollution and Its Degradation in Soil …… *Xu Ruiwei* (徐瑞薇), *Qian Wenheng* (钱文恒) and *Li Deping* (李德平) (841)
Effects of L-Cysteine on the Activity and Conformation of L-Asparaginase …… *He Zhongxiao* (何忠效), *Qian Shijun* (钱世钧), *Hao Fengxi* (郝风兮) and *Meng Guangzhen* (孟广震) (878)
Discovery of Phycobilin in *Gymnodinium Cyaneum* Hu. Sp. Nov. and Its Phylogenetic Significance …… *Hu Hongjun* (胡鸿钧), *Yu Minjuan* (俞敏娟) and *Zhang Xiankong* (张宪孔) (882)
Effect of Actinomycin D and Cycloheximide on the Formation of Peroxidase During Embryogenesis and Germination of Rice (*Oryza Sativa* L.) …… *Zhu Zhiping* (朱治平), *Wang Manli* (汪曼丽), *Shen Ruijuan* (沈瑞娟) and *Tang Xihua* (唐锡华) (956)

Agricultural Sciences

A Study on Background Values of Twelve Elements in Soils of Beijing and Nanjing …… *Group on Natural Background Values of Soil* (75)
Division of Regenerated Cells From Mesophyll Protoplast of Barley …… *Yan Qiusheng* (颜秋生) and *Li Xianghui* (李向辉) (609)
Induction of Plantlet From Floral Bud of Watermelon (*Citrullus Vulgaris Schrad*) in *Vitro* …… *Song Zongmiao* (宋宗淼) (709)
Studies on Bunchy Stunt Disease of Rice, a New Virus Disease of Rice Plant …… *Xie Lianhui* (谢联辉) and *Lin Jiying* (林奇英) (785)
Rice Ragged Stunt Disease, a New Record of Rice Virus Disease in China …… *Xie Lianhui* (谢联辉) and *Li Jiying* (林奇英) (960)
Correlating Analysis of Organic Matter Content and Spectral Reflection Properties of the Soil in Southern Xinjiang …… *Xu Binbin* (徐彬彬) and *Dai Changda* (戴昌达) (1041)
Sex Pheromone of Corn Borer *Ostrinia Furnacalis* …… *Cheng Zhiqing* (程志青), *Xiao Jincheng* (萧锦澄), *Huang Xianting* (黄暹廷), *Chen Denglong* (陈登隆), *Li Jianquan* (李健全), *He Yansheng* (何炎声), *Huang Shangren* (黄尚仁), *Luo Qingchang* (罗庆昌), *Yang Chaoming* (杨朝明) and *Yang Zanxi* (杨赞素) (1045)

Medical Sciences

Alterations of Enkephalin Contents in Brain Regions by Acupuncture …… *Zou Gang* (邹 冈), *Yi Qingcheng* (易庆成), *Wang Fansheng* (汪范生), *Lu Yixing* (陆以信), *Zhang Zuxuan* (张祖暄) and *Wu Shixiang* (吴时祥) (78)
Spontaneous Discharges of Habenular Nucleus and Its Inhibitory Action on Nucleus Raphe Magnus …… *Wang Shao* (王 绍), *Jiang Yan* (江 岩), *Xiao Jiasi* (肖家思), *Liu Minzhi* (刘敏芝) and *Liu Suping* (柳苏平) (83)
Preliminary Study on Antiradiation Effect of Lingzhi …… *Lin Zhibin* (林志彬), *Zhang Zhiling* (张志玲), *Liu Huiren* (刘慧人), *Wu Yucheng* (吴玉成), *Ruan Yuan* (阮 元), *Cai Zhiji* (蔡志基), and *Cong Zheng* (丛 铮) (176)
Effect of Electrical Stimulation of Acupuncture Point "Medium Spinae" on the Contents of 5-HT and 5-HIAA in Substantia Nigra of Midbrain in Rabbits …… *Ye Weiling* (叶惟泠), *Feng Xiaochun* (冯小椿), *Zhao Danfeng* (赵丹凤), *Zhang Jianwei* (张建伟) and *Zhang Jin* (张 瑾) (180)
An Improved Differential Staining Method for Sister Chromatids …… *Wu Min* (吴 旻) and *Wang Xiuqin* (王秀琴) (261)

Interaction of Nociceptive Splanchnic Impulses and Acupuncture Signals in Cerebral Cortex ······ *Chen Peizi* (陈培熏), *Chen Zhuhua* (陈助华), *Weng Jiwei* (翁纪伟) *Ren Huifang* (任惠芳), *Zhang Jinmei* (张金梅), *Zhang Jinhang* (张景行) and *Feng Jianqiang* (冯鉴强) (263)
Effect of Electro-acupuncture at Point *Zusanli* on Activity of Muscle Mechanoreceptors and Afferent Fibers in Cats ······ *Tan Depei* (谭德培), *Zhang Shujie* (张淑洁) and *Mao Jianping* (毛建萍) (352)
Influence of Pain Signal on Pain Threshold and Brain Norepinephrine and 5-hydroxytryptamine Concentration ······ *Tang Cimei* (汤慈美), *Lin Wenjuan* (林文娟) and *Sun Lihua* (孙丽华) (438)
Isolation and Structure of a Natural Metallic Compound——Zincpolyanemine ······ *Xu Bingxiang* (徐炳祥), *Han Gongyu* (韩公羽), *Wang Xiaopeng* (王肖鹏), *Liu Mingshu* (刘明殊), *Xu Xueyu* (许学余), *Meng Lining* (孟利宁), *Chen Zhongliang* (陈仲良) and *Zhu Dayuan* (朱大元) (444)
Isolation and Characterization of Maytansine and Maytanprine, Two Anticancer Agents From *Maytenus Hookeri* Loes ······ *Zhou Yunli* (周韵丽), *Huang Liying* (黄丽瑛), *Zhou Qianru* (周倩如), *Jiang Chuxiang* (蒋初祥), *He Xianguo* (贺贤国), *Li Chaomin* (李朝明), *Wang Chun* (王 春) and *Li Bingjun* (李秉钧) (612)
Effects of Zhishi and Its Active Principles——Synephrine and N-Methyltyramine on the Contractility and Automaticity of Cat Papillary Muscle ······ *Jia Hongjun* (贾宏钧), *Feng Qingquan* (冯清泉) and *Guo Zhaogui* (郭兆贵) (616)
Gold Thioglucose Hypothalamic Obesity Syndrome ······ *Qin Zhengyu* (秦正誉) (790)
The Common Basis of Electro-Acupuncture Analgesia and Morphine Analgesia ······ *Zhang Zuxuan* (张祖暄), *Zhang Yuanzhen* (张媛贞), *Yu Qixiang* (余启祥), *Li Chunbao* (李春宝) and *Chen Rongsan* (陈荣三) (872)
Inhibition of Viscero-somatic Reflex by Midbrain and Thalamus Stimulation: Effect of Lesion of Nucleus Raphe Magnus ······ *Du Huanji* (杜焕基), *Zhao Yanfang* (赵燕芳) and *Zheng Ruikang* (郑瑞康) (964)
Pharmacological Studies on New Analogs of Tremorine (I) ······ *A. W. Baloch, D. Dobrescu, E. Cristea* and *M. Iovu* (1051)

Technological Sciences

A Microarea Electron Diffraction Analysis of 69*R* and 147*R* Polytypes of SiC ······ *Guo Kexin* (郭可信), *Zhou Jing* (周 敬) and *Wu Yukun* (吴玉琨) (70)
An Experimental Research on a New Type of Elastic Metallic Seal Ring ······ *Fang Qingxian* (方庆贤) and *Mu Peiqing* (木沛清) (255)
Correlation Between Luminosity and Some Emission Line Intensity Ratio of QSOs ······ *Bian Yulin* (卞毓麟), *Yang Lantian* (杨兰田), *Ai Xiaobai* (艾小白) and *Xiao Xinghua* (肖兴华) (304)
Application of Inorganic Gas-chromatography to Determination of H_2O and CO_2 in Rocks and Minerals ······ *Jiang Xiaozhong* (蒋孝中), *Fang Zhiqing* (房志清), *Chen Wenjun* (陈文筠), *Zhou Yihe* (周以荷), *Jiang Bangjie* (江邦杰) and *Sun Xinyi* (孙新一) (332)
A System of Color Moving Window Display and Analysis ······ *Wang Chengye* (王成业) and *Li Zhirong* (李志荣) (348)
Some Investigations on Ultrahigh Pressure Sintering of Polycrystalline Diamond ······ *Shen Zhutong* (沈主同) and *Sun Guoxian* (孙帼显) (378)
Displacement of Plasma Column in CT6B Tokamak ······ *Zhang Zexiang* (张泽湘) (383)
Mössbauer Effect Spectra of $PbFe_{11}O_{19}$ Single Crystal ······ *Liu Jizhe* (刘寄浙), *Zhang Yuchang* (张毓昌), *Jiao Hongzhen* (焦洪震) and *Zhai Hongru* (翟宏如) (388)
Principle of Structural Invariability in Electrohydraulic Servo-system ······ *Liu Changnian* (刘长年) (472)
Spin-glass Transition of $Fe_4Mo_{18}Ni_{78}$ Alloy ······ *Zhang Dianlin* (张殿琳), *Cui Changgeng* (崔长庚), *Zhi Shenghui* (智升慧), *Lin Shuyuan* (林淑媛) and *Wang Zulun* (王祖伦) (477)
Laser Isotopic Enrichment of $^{34}SF_6$ and the Preparation of S ······ *Kong Fanao* (孔繁敖), *Yu Shuqin* (俞书勤) and *Liu Yushen* (刘玉申) (551)
A Large Format Electrographic Camera for Astronomy ······ *Group of Photoelectronic Image Devices, Beijing Astronomical Observatory*, Group No. 403, Institute of Electrical Engineering and Laboratory No. 8, Institute of Electronics, *Academia Sinica* (中国科学院北京天文台光电成象组，电工研究所 403 组，电子研究所第八研究室) (605)
Application of Innovation Method of Random Sequences in Power System Load Forecasting ······ *Xu Lizi* (徐立子), *Du Jinguan* (杜金观), *Xiang Jingtian* (项静恬) and *Gu Lan* (顾 岚) (643)
On Short-Term Correlation of Cleaning Discharges in Tokamak CT-6 ······ *Wang Long* (王 龙) (728)
Unipolar Arcing in Tokamak CT-6 ······ *Wang Long* (王 龙) (812)
On Similarity and Duality of Computation ······ *Hong Jiawei* (洪加威) (970)

LETTERS

MATHEMATICS

Local Maximum Theorem for Schlicht Function ······ *Ren Fuyao* (任福尧) (94)
On Nonlinear Mixed Boundary Values Problem ······ *Fang Ainong* (方爱农) (183)
On Ergodic Quasi-invariant Measures ······ *Yang Yali* (杨亚立) (183)
A Note for Rotation Theorem of Close-to-Convex Function ······ *Yao Biyun* (姚璧芸) (270)
Perturbation of Almost Periodic Solution of Differential System ······ *Lin Zhengsheng* (林振声) (270)
Last Exit Distributions for *N*-dimentinal Brownian Motion ······ *Wang Zikun* (王梓坤) (446)
On Opial's Inequality ······ *Wang Silei* (王斯雷) (532)
A Class of Equations in Free Groups ······ *Lo Libo* (罗里波) (532)
О обобщённых полиномах Л. В. Канторовича и их асимптотических поведениях ······
······ *Cao Jiading* (曹家鼎) (621)
Quelques formules sur le temps local des semimartingales ······ *Yan Jiaan* (严加安) (622)
Admissibility of Quadratic Estimates of Error Variance in Linear Models ······
······ *Li Guoying* (李国英) et al. (623)
On Limit Cycles of Quadratic Systems ······ *Shi Songling* (史松龄) (711)
On Limit Cycles for a Class of E_3 ······ *Xu Shilong* (徐世龙) (797)
On Discrete Phenomena in Mixed Problems ······ *Wang Chuanfang* (王传芳) (797)
On Convergence of King-Werner's Iteration Procedure for Solving Nonlinear Equations ······
······ *Wang Xinghua* (王兴华) et al. (885)
Conditions of Existence of the Limit Cycles of Liènard Equation With Alternate Damping ······
······ *Huang Qichang* (黄启昌) et al. (1059)
An Invariance Principle for a Class of Dependent Sequences ······ *Lin Zhengyan* (林正炎) (1059)
On Spectrum of Hyponormal or Semi-hyponormal Operator ······ *Xia Daoxing* (夏道行) (1060)
On Coefficients of Schlicht Functions ······ *Hu Ke* (胡　克) (1061)

PHYSICS

Hydrodynamical Theory of Three-dimensional Density Wave for Spiral Structure of Galaxies ······
······ *Xu Jianjun* (徐建军) (94)
A New Concept of Cutting Marks Formation in Metal Cutting Vibration ······
······ *Dai Depei* (戴德沛) et al. (271)
An Empirical Correlation Between Superconducting Transition Temperature T_c and the Hall Coefficient
in Amorphous Superconductors ······ *Cao Xiaowen* (曹效文) et al. (533)
Laser Cooling of Gas Atoms by "a. c. Stark Effect" ······ *Wang Yuzhu* (王育竹) (712)
Existential Arguments for Superheavy Elements ······ *Yu Chuanzan* (喻传赞) (798)
Nontricritical Behavior of Nematic-Isotropic Transition in Liquid Crystals ······ *Lin Lei* (林　磊) (798)
Transformation Between Mode Representation and Generalized Ray Representation of Sound Field
······ *Gao Tianfu* (高天赋) et al. (885)
A Device for High-Speed Framing Interferography With Pulsed He-Ne Laser ······
······ *Xia Shengjie* (夏生杰) (888)
High Power and High Efficiency XeCl Laser ······ *Chen Jianwen* (陈建文) et al. (973)
Determination of Lattice Parameters of Non-cubic Systems From Pairs of X-ray Diffraction Lines
······ *Guo Changlin* (郭常霖) et al. (1091)

CHEMISTRY

Molecular Weight Distribution of Multifunctional Polymers ······ *Yan Deyue* (颜德岳) et al. (446)
Attempted Syntheses of *Double-String-Bag* Model Compounds for the Active Center of Nitrogenase
······ *Nitrogen Fixation*
Research Group, Fujian Institute of Research on the Structure of Matter, Academia Sinica (533)
Rare Earth Elements in Some Soils From Guangzhou ······ *Tang Songliu* (唐诵六) et al. (535)
Studies on Development-free Vapor Photolithography ······ *Pei Rongxiang* (裴荣祥) et al. (712)
Determination of the Nonretained Value in High Performance Liquid Chromatography ······

...... *Hu Zhenyuan* (胡振元) et al. (886)
Another Form of Quantitative Di-region Equation of Carcinogenic Activity for Polycyclic Aromatic Hydrocarbons ...... *Dai Qianhuan* (戴乾圜) et al. (973)
Quantitative Structure-carcinogenic Activity Relationship of Methyl Substituted Polycyclic Aromatic Hydrocarbons and Cholanthrene Series ...... *Dai Qianhuan* (戴乾圜) et al. (974)
Regularity of the Hydrolysis Capacity of Metal Ions ...... *Yang Jinyuan* (杨进元) (975)
Analysis of C-NMR Spectra in Predominantly Isotactic Polypropylene ...... *Zhu Shannong* (朱善农) et al. (1062)

ASTRONOMY

Experimental Determination of the Mass of a Neutron Star ...... *Yu Chuanzan* (喻传赞) (886)

EARTH SCIENCES

Application of Sudden Change Presages to Imminent Earthquake Predictions ...... *Lu Dajiong* (吕大炯) (95)
Study on Graphical Representation of Phase Equilibria in Unary Five-phase ($n + 4$) Multisystems ...... *Guo Qiti* (郭其悌) (96)
Magnetostratigraphic Study on the Cave Deposits Containing Fossil Peking Man at Zhoukoudian ...... *Qian Fang* (钱　方) et al. (359)
Molecular Weight and Molybdenum, Iron, Sulfur Contents of MoFe-Protein of Nitrogenase From *Asotobacter Vinelandii* ...... *Zhuang Zonghao* (庄宗浩) et al. (359)
Uranium-Series Dating of Peking Man ...... *Zhao Shusen* (赵树森) et al. (447)
Radiocarbon Dating of Fossil Mammal Bones From the Upper Cave ...... *Chou Shihua* (仇士华) et al. (448)
Age Determination of Peking Man by Fission Track Dating ...... *Guo Shilun* (郭士伦) et al. (535)
Discovery of *Holotrichia* and Other Insect Fossils in the Lower Pleistocene of Beijing ...... *Wang Ande* (王安德) et al. (623)
Nonlinear Computational Instability of Arakawa's Schemes and Three Stable Schemes for Long Term Numerical Integration ...... *Ji Zhongzheng* (季仲贞) (800)
Review on Uppermost Permian Flora of Qilianshan Region ...... *Wang Deru* (王德旭) et al. (800)
A New-Type Lithium Ion-selective Electrode ...... *Gao Shaowen* (高绍文) et al. (887)
Petrochemical Features of Cenozoic Volcan ic Rocksin Western Part of Yunnan Province ...... *Zhang Wenhua* (张雯华) et al. (976)

AGRICULTURAL SCIENCES

A Study of Anther Culture of Glycine Max ...... *Yin Guangchu* (尹光初) et al. (976)

MEDICAL SCIENCES

Synthesis of Homoharringtonine ...... *Wang Yongkeng* (王永铿) et al. (624)

CSO: 4008

AUTHOR: ZHONG Humian [6945 3840 4375]
YU Zhongming [0205 0022 2494]

ORG: None

TITLE: "On the Invariant Set and Periodicity of the Solution of a Class of Probability Measure Equations"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 1-11

TEXT OF ENGLISH ABSTRACT: Let the phase space of a stochastic process be a metric measurable space. At time t, denote the probability distribution of a stochastic process with the initial distribution ϕ by $m(t, \phi, \cdot)$. We assume that the family of probability measures $\{m(t, \phi, \cdot), t \geqslant 0\}$ satisfies the semi-group property. Consider the equation of the one-parameter measure family:

$$\psi(t + s, \cdot) = m(s, \psi(t), \cdot), \; t \geqq 0, \; s \geqslant 0.$$

$$\psi(0, \cdot) = \psi_0(\cdot).$$

There exists a unique family of solution measures for this equation. In this paper we discuss some properties of this measure family.

In the second section the invariance theorem is proved after several lemmas are established. On the time interval $[0, \infty)$, we prove that the limit set of

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 1-11]

$\{m(t, \phi, \cdot), t \geqslant 0\}$ is a non-empty, weakly bounded and weakly compact invariant measure set under some conditions. The proof of this theorem is simpler and the conditions weaker than those given by Kushner.

In the third section we consider a time-homogeneous Markov process associated with a stochastic continuous transition function. We prove that there are only three possible cases for the solution of the measure equation: the equilibrium measure or the family of periodic measures from certain moment on, or the measures of the solution are different from each other.

AUTHOR: XU Jiafu [1776 1367 4395]
QIAN Shijun [6929 1102 6874]

ORG: None

TITLE: "On the Design and Implementation of the Systems Programming Language XCY"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 13-21

TEXT OF ENGLISH ABSTRACT: The systems programming language XCY is chiefly designed for writing systems programs, e.g., compilers and operating systems. The production rate of computer software may be prominently increased by using this language as a production tool. In this paper are emphasized some important features of its design and implementation, especially its design objective and requirements, data structures, modules, paths, and the storage scheme used in the DJS-200 XCY compiler.

AUTHOR: LUO Liaofu [5012 6697 1788]
LU Tan [7120]

ORG: None

TITLE: "Conserved Currents and Weak Neutral Current Interactions"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 23-30

TEXT OF ENGLISH ABSTRACT: Assuming that the conserved currents are sources of the vector meson fields, the vector fields Z's coupled to baryon and lepton number are discussed. The linear combinations of baryonic, leptonic and electromagnetic currents are related to weak neutral currents, which fit all the present neutral current experiments. Several theorems concerning $e-\mu-\tau$ asymmetry of Z meson's couplings have been proved; the $e-\mu-\tau$ mass differences are thus accounted for by a corresponding mechanism.

AUTHOR: ZHU Cansheng [2612 3605 3932]

ORG: None

TITLE: "The Investigation of the Physical Condition of Prominences"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 31-36

TEXT OF ENGLISH ABSTRACT: In this paper we introduce macroscopical motion of mass and prove convincingly the conclusion by Dubov that the turbulence velocity V_t is correlated with μ. Therefore, it is reasonable to determine the temperature of the prominence with hydrogen and helium lines. Using the data of Ye, we calculate and eventually tell the physical features of the hydrogen prominence from the metal one. For the former, $T_e = 7340$, $V_t = 4.3$, $N_2 = 2 \times 10^{13}$; for the latter, $T_e = 5520$, $V_t = 6.7$, $N_2 = 1 \times 10^{14}$. It is found that the prominence at higher temperatures corresponds to lower density, and vice versa, like chromosphere.

AUTHOR: CHEN Jinquan [7115 6855 0356]
GAO Meijuan [7559 5019 1221]
WANG Fan [3769 0416]
YU Zurong [0060 4371 2837]

ORG: None

TITLE: "A New Approach to the Representation Theory of Finite Groups (III)--Application of Eigenfunction Method to Point Groups"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 37-48

TEXT OF ENGLISH ABSTRACT: The "Eigenfunction Method" is used to treat the molecular symmetries; a simple method is given for constructing Symmetry-Adapted-Linear-Combinations in the single electron case. The so-called "intrinsic quantum numbers" are introduced to serve as the missing labels in multiplicity cases.

AUTHOR: DAI Anbang [2071 1344 6721]
XIN Xinquan [1823 2450 3123]
ZHU Longgen [2612 7893 2704]
et al.

ORG: None

TITLE: "Studies on Alkali Metal Promoted Iron Catalyst of Ammonia Synthesis"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 49-58

TEXT OF ENGLISH ABSTRACT: When iron oxalate carried by active carbon was first reduced and then plated with metallic potassium, the ammonia synthesis catalyst thus formed exhibited especially high activity. After an intensive study of each component of the catalytic system, the following results have been obtained:

Mossbauer spectrum revealed that the active site of the catalyst was composed of particulate α-iron having sizes around 100 Å. The active center was in the (111) plane of α-iron with seven atoms forming a Fe_7-cluster in which activation of dinitrogen took place. EHMO method of calculation showed that Fe_7-cluster was the most efficient structure of iron catalyst to activate dinitrogen and it reduced the bond overlap population from 1.640 to 1.004, corresponding roughly to the reduction of the triple bond to a double bond. It was the π-bond that was greatly

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 49-58]

weakened while the σ-bond remained nearly the same.

Metallic potassium in the catalyst formed potassium hydride with dihydrogen, first having activated dihydrogen. Results of the SCCC method of calculation of FeH showed that H in the hydride bore a charge of 0.199 electron. Action of active carbon, the carrier, was independent of the degree of its graphitization, but dependent on its specific surface and distribution of its pore size. A pore size around 100 Å was most suitable for the formation of the Fe_7-cluster. As for the other kinds of carriers, either because of having too small a bore size (e.g., molecular sieve) or because of the oxygen constituent (e.g., SiO_2, Al_2O_3, etc.), they were unfavorable for the formation or function of the Fe_7-cluster. Chloride-ion was a poison for the iron catalyst of ammonia synthesis because it caused the agglomeration of the superfine particles of α-iron and hence destroyed the active site with the result of the loss of activity.

AUTHOR: DING Yingru [0002 3602 1172]
XIA Yuanfu [1115 0337 1788]
YE Chunhao [5509 4783 3493]
et al.

ORG: None

TITLE: "The Mossbauer Spectroscopy Research of Fe-Cr Catalyst under the Reaction Condition"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 59-64

TEXT OF ENGLISH ABSTRACT: Through the measurements of Mossbauer spectra under the reaction condition (350°C, water:gas = 2:1, velocity of gas = 250 ml/hr), it is shown that S_8 belongs to the $Fe_{3-x}Cr_xO_4$ system. After the treatment at 550°C the area of the paramagnetic spectrum increases. It indicates that a more fine-particle solid solution is formed. Raising the space velocity the reduction is incomplete and γ-Fe_2O_3 is formed. At this condition γ-Fe_2O_3 may be the intermediate phase of α-Fe_2O_3 reducing to Fe_3O_4. The increasing in amount of fine-particle solid solution results in the rising of the catalytic activity.

AUTHOR: ZHU Dexu [2612 1795 3563]
SUN Leqin [1327 2867 3830]
ZHANG Aile [1728 1947 2867]

ORG: None

TITLE: "The Chemical Kinetics of Direct Hydrolysis of N-Carbo-Benzoxy-L-Tyrosine P-Nitrophenyl Ester by Two Molecular Forms of Urokinase"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 65-73

TEXT OF ENGLISH ABSTRACT: When using plasminogen as the substrate, the Km value for 54,000 mol. wt. urokinase was half the value for the 33,000 mol. wt. urokinase. When using CTN as the substrate, the Km value for the 54,000 mol. wt. urokinase and the 33,000 mol. wt. were 5×10^{-4} M and 4×10^{-4} M respectively.

The effect of pH on the enzyme-catalyzed hydrolysis of CTN ester has been found to be of the non-competitive type for both the high molecular urokinase and the low molecular urokinase. This fact showed that in the present case, $k_{-1} \gg k_2$ or Km = $\frac{k_{-1}}{k_1}$, i.e., the Km was actually the reciprocal of the equilibrium constant for the formation of the enzyme-substrate complex. The pK value of the ionizable group of the active center was evaluated by LogV-pH plot. The high molecular urokinase had the pK value of 7.65 and that of the low molecular urokinase was 7.85.

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 65-73]

The E-aminocaproic acid acted as a competitive inhibitor of both high molecular urokinase and low molecular urokinase. The evaluated dissociation constant Ki for the assumed H-UK-EACA complex was 0.8×10^{-2} M and 1.5×10^{-2} M for the L-UK-EACA complex. The CTN hydrolysis activity of the forms of urokinase was not affected by natural inhibitors of trypsin of different sources.

The influence of temperature on both the Km and V for the hydrolysis of CTN has been determined and the thermodynamic constants for the equilibrium reaction have been evaluated.

The kinetic and thermodynamic data indicated that the active center of the two forms of urokinase was identical in chemical nature, but their conformations differed from each other. The conformation of the high molecular urokinase facilitated the catalysis of CTN hydrolysis with higher efficiency.

AUTHOR: LIU Xiaoshan [0491 1321 0810]
CHEN Zhuqi [7115 6175 7784]
CHEN Yongqing [7115 3057 3237]
et al.

ORG: None

TITLE: "The Texture and Structure of Ores from the Sulfide Deposits of Qixiashan, Nanjing. and Their Implication on the Ore Genesis"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 75-94

TEXT OF ENGLISH ABSTRACT: The pyritic lead-zinc deposits of Qixiashan in the Nanjing Hills, some 20 km east of Nanjing in Jiangsu Province, discovered in 1950, have long been thought to be undoubtedly epigenetic and hydrothermal in origin. The writers recently studied the deposits in detail. There were much interested when they found different sorts of framboidal pyrite in the concretionary and also in the laminated ores of the deposits. Some of the framboidal pyrites have the distinct cellular structures of fossilized tissues of algae, and some can be identified to be Solenapora. The framboids are now made up mainly of pyrite and melnikovite. The interstices between the "cells" are mostly filled with organic matter. The internal structures of the cellular tissues are of two kinds: (1) the cells, about 20μ in size, are arranged in radiating siphon-like bodies, and (2) the cells, of 40 to 60μ in size, are arranged orderly. Associated with the iron

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 75-94]

sulfide framboids, there are also some metacolloidal structures composed of marcasite and wurtzite. It is probable that the sulfides were formed when the decaying biogenic protoplasm occurred in the presence of sulfur-reducing bacteria to produce HS^-, which combined with Fe^{++} to yield framboidal melnikovite and its recrystallized product, pyrite. Therefore, they were formed by biochemical processes as a result of syngenetic sedimentation and early-diagenetic products.

The ore bodies are mostly stratiform, stratoid, or in large lenticular forms. The ores are laminated, banded, or in concretionary layers. These structures of the ore bodies are mainly parallel to the stratification of the country rocks. Such kinds of ore constitute the main industrial ores of this district. The age of the ore formation belongs to the early to middle Carboniferous period.

But there are also evidently hydrothermal effects which are superimposed upon the syngenetic ore-forming processes, resulting in the formation.

AUTHOR: REN Meie [0117 5019 6948]
LIU Zhenzhong [0491 2182 0022]
WANG Feiyan [3769 7378 3601]
et al.

ORG: None

TITLE: "Karst of China and Principles of Its Development"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 95-108

TEXT OF ENGLISH ABSTRACT: In China, carbonate rocks cover an area of more than 1.3 million km^2, or about one-seventh of the total area of the country. China ranks among the most typical and extensive karst countries of the world.

(1) Types of Karst
Karst of China may be grouped into three main types, i.e., tropical, subtropical (or Mediterranean type) and temperate.

Tropical karst is dominated by mogotes-cockpits, which form characteristic landscape of southern Guizhou and northwest Guangxi. Karst of the temperate zone is characterized by dry valleys and large karst springs, with well developed karst fissures underground, but few surface karst forms. Subtropical karst consists of gentle karst hills and depressions.

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 95-108]

The great difference between karst of different climatic zones is mainly due to bio-climatic factors. It is well known that biogenic CO_2 is important in the development of karts. In the tropical rainforest of south China, the amount of fallen leaves and branches per year is about three times that of the temperate mixed forest. Therefore, the CO_2 content of soil air in laterite is about two to five times higher than that of red soils (central China) and black soils (north China). As a result, the rate of corrosion in central Guangxi is two to five times higher than that of the Changjiang basin, and 7 to 10 times higher than that of north China. Evidently, the development of typical tropical karst forms, such as mogotes, cockpits and "stone forest" (or crevice karst), owes much to this cause.

(2) Paleo-karst

In China, the distribution of tropical karst far exceeds the limit of the present tropical zone. Tropical mogotes are widely distributed in southern Hunan, southern Guizhou and eastern Yunnan where the present climate is subtropical. In the famous "stone forest" region of Lunan, depressions between limestone pinnacles are filled with sediments of old Tertiary age. This fact shows conclusively that these tropical "fossil" karsts must have developed in early Tertiary, but under the present climatic conditions they have been gradually modified and reduced to less than 100 m high. They are known as relict mogotes.

The discovery of old tropical mogotes in the Tibetan Plateau is one of the most important contributions of karst research in China. They are widely distributed

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 95-108]

in the Tibetan Plateau, reaching an altitude of 5200 m above sea level, the highest mogote known in the world. There were also formed in Tertiary when the climate of Tibet was moist and hot, as proved by Miocene-eary Pliocene Hipparion-Samotherium sp and paleotragus microdon fauna recently discovered in Tibet. But under the present periglacial climatic regime, these Tertiary mogotes have been mostly destroyed by frost action and solifluction and their ended remnants stand only as isolated steep limestone hills about 20-30 m high. It is not an accidental phenomenon that these old mogotes have been discovered widely in the elevated plateaus north of the Himalaya-Alpine mountain system in the world, i.e., from the Tibetan plateau westward through Pamir, Caucasus, southern Poland to the Swabian Alps of Germany, all situated along the coast of the Tethys Sea and influenced by the tropical Tethys current. This fact agrees well with the main theme of plate tectonics.

(3) The Influence of Rock, Structure Topography

1) Carbonate rocks In addition to chemical composition, rock texture also exerts an important influence on karst. For example, in central Shandong, karst is better developed in some dolomite and clayey-dolomitic limestone karst is better than pure limestone because the former consists of bioclastic limestone oolitic limestone and grainstone. In central Guizhou and Guangxi, karst is usually better developed in bioclastic limestones.

2) Structure It is well known that structure has a distinct influence on the development of karst. A remarkable example is karst of eastern Sichuan where,

superposed on the general pattern of relief of parallel ridges and valleys due to close folding of the northeast-southwest direction, are narrow karstic "trough valleys" on the top of anticlinal ridges. These "trough valleys," up to more than 100 km long, developed in the axis of anticlines due to the outcrops of limestones there. This particular type of karst morphology is known as Eastern Sichuan karst in China.

3) Topography The long-established principle that the degree of karstification is more pronounced in river valleys than on water divides does not agree with actual facts in China. In the Yunnan-Guizhou plateau and mountains of the border of Sichuan, Hunan and Hubei, it is generally found that karst is more strongly developed in water divide areas. This is probably due to the fact that these water divides belong to karst peneplains of old Tertiary age (or Pre-Tertiary) and karstification has continued from that time to the present, so that recent karst is superposed on old karst, resulting in more pronounced karst features both on the surface and underground.

The correlation between caves and river terraces should be used with great caution. There are a number of caves in China where the altitude of caves does not correspond to that of river terraces. The reasons for this are varied and are enumerated in the Chinese text.

(4) Deep Karst

During the last two decades, a large number of deep caves, situated far below sea level or the land surface, has been found in China. They may be grouped under four categories:

1) Deep caves within recently uplifted plateaus or mountains in Guizhou, found at 400 m below the summit surface, whereas in northern Sichuan they lie at 800 m below the summit surface. They are mostly vertical caves filled with clay or mud, probably corresponding to the clay filling stage of cavern development in an uplifted peneplain.

2) Deep caves close to sulfide ore bodies in pyrite, galena and copper ore regions of China, of which a line of deep caves is often found in the contact zone between carbonate rock and ore bodies. One deep cave in Anhui lies at -350 m. Evidently this is chiefly due to the fact that during the oxidation of sulfide ores, a large amount of SO_4 ions is formed which greatly increases the corrosive power of the ground water.

3) Deep caves formed by pressure water with a steep hydraulic gradient or siphon circulation, such as caves at 10 or more than 100 m below the river bed in the gorges of the Changjiang and Wujiang.

4) Buried caves of ancient geological age. In a coal mine of central Guangxi, deep caves at -700 m were probably formed in the Permian. However, as they are located near the axis of a syncline, they still act as conduits of present ground water circulation. At present, these deep caves are largely void; however, some are filled with silt and silty sand which is not cemented and has distinct micro-cross bedding. This indicates that the ground water at such great depth is still a turbulent flow. Therefore, although products of the geological past, these deep

[Continuation of NANJING DAXUE XUEBAO No 4, 1979 pp 95-108]

caves are continuously being reshaped by the present ground water circulation. Deep caves below the north China plain are probably of the same character.

The origin of deep caves is attributed to the fact that ground water at great depth still possesses considerable corrosive power due to (1) relatively high velocity of deep ground water in favorable structure setting, (2) its high content of CO_2, (3) its comparatively high content of SO_4 ions and (4) the effect of mixing corrosion. The above factors are all substantiated by the Chinese data of veins, veinlets, networks and some drussy ores. The veins have the characteristics of fracture-filling and metasomatism accompanied by silicification and baritization. In such ores, commonly the pyrite is partly replaced by sphalerite which, in turn, is partly replaced by galena. Thus, the lead-zinc ores of this district are mainly related to this mode of mineralization. Taken as a whole, the genesis of the ores of this district should be considered as syngenetic sedimentation superimposed by hydrothermal effects.

AUTHOR: YAO Zhensheng [8010 2650 3932]
SHENG Chengyu [4141 2110 4416]
LU Wenfang [4151 2429 5364]

ORG: None

TITLE: "The Variation of Flood and Drought in the Latest Centuries in Eastern China"

SOURCE: Nanjing NANJING DAXUE XUEBAO [JOURNAL OF NANJING UNIVERSITY], Natural Sciences Edition in Chinese No 4, 1979 pp 109-121

TEXT OF ENGLISH ABSTRACT: The data analyzed in this paper were produced from the two historical climatic records seminars which were held at the Geophysical Department of Beijing University and the Meteorological Department of Nanjing University respectively in 1974 and 1977 under the auspices of the Research Institute of the Central Meteorological Bureau (now called the Academy of Meteorological Science of the Central Meteorological Bureau). The paper mainly analyzes the following topics: 1. Variability of flood and drought; 2. Persistence and interchangeability of flood and drought; 3. Periods and cyclic periods of drought and flood; 4. Regional variation and types of flood and drought; 5. The variation and trend of flood and drought.

9717
CSO: 4009

AUTHORS: WANG Li [3769 2980]

ORG: None

TITLE: "Multiplex Photogrammetry - A Novel Reconnoitre"

SOURCE: Beijing HAIYANG [OCEANS] No 9, 15 Sep 80 pp 25-26

ABSTRACT: Based on a recollection of the allied landing on Okinawa in 1942 of the Second World War, the authors introduce the principles and performance theory of multiplex photogrammetry, where as much as nine filter lens covering a wide range of wavelengths are incorporated into survey cameras, which distinguishes all types of objects and variations at various depths of coastal sea water, and provides clear pictures of ocean floor topography , hidden reefs, and water depths, besides detection of petroleum pollution in oceans. It is reported that, in barely three years, China has successfully self-developed two models of such cameras that cover the ranges of ultraviolet, visible and infrared.

AUTHOR: JING Yuan [7234 8673]

ORG: None

TITLE: "Prof. Yu's Conversation on Space Survey Ships"

SOURCE: Beijing HAIYANG [OCEANS] No 9, 15 Sep 80 pp 29-30

ABSTRACT: The author reports a visit to a certain ship design and planning laboratory, where Prof. Yu explained and illustrated with photographic slides, models and tape recordings the functions of such space survey ships as target survey ships, satellite tracking ships and space survey ships in the monitoring, remote control and communication of intercontinental missiles and space crafts. The characteristics of radar antenna and ship stabilizingequipment, as well as the design of various facilities indispensible to such type of ships are also described.

11,206
CSO: 4009

END

JPRS 77204

19 January 1981

China Report

SCIENCE AND TECHNOLOGY

No. 78

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 77204

19 January 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 78

CONTENTS

NATIONAL DEVELOPMENTS

Science Symposium Puts Proposals to Government
(XINHUA, 9 Dec 80) 1

Director of Acoustics Institute Interviewed
(XINHUA, 22 Dec 80) 3

Anhui Scientific, Technological Association Congress Ends
(Anhui Provincial Service, 26 Dec 80) 5

Congress Activities
Resolution Adopted

Electronics Society Holds National Congress
(XINHUA Domestic Service, 23 Dec 80) 6

Briefs

Electronics Journals' Commendations 7
Anhui Science Association 7
Guizhou Awards Ceremony 7
Hebei Scientific Research Forum 7
New Society Formed 8
Rare Earth Society 8
County Scientific Bodies 8
Jiangxi Scientific Research Forum 8
Shanghai Laser Study 8
Gansu Infrared Television Microscope 8
Jiangxi Experts Promotion Meeting 9
Shanghai Scientific Research 9
Xinjiang Computer Center 9

PHYSICAL SCIENCES

Briefs

Astronomers on Climatic Changes 10

APPLIED SCIENCES

PRC Makes Optical Fiber Used in Communications
(XINHUA Domestic Service, 25 Dec 80) 11

PRC Institute Develops Large Color TV Crystal
(XINHUA, 22 Dec 80) 12

Technique for Preventing Loss of Synchrony by Electric Motors Developed
(Sun Guanlong; GUANGMING RIBAO, 30 Nov 80) 13

Briefs
First Congress Ends 15
Architectural Society Congress 15
Shanghai Automatic Dialing 15

LIFE SCIENCES

Improvement in Care for Rural Children Reported
(XINHUA, 24 Dec 80) 16

Researchers Increase Knowledge of Stomach Cancer
(XINHUA, 19 Dec 80)... 17

Briefs
Bio-Medical Engineering Society 19
Guangxi Minority Medical Classes 19
Guangxi Medicinal Plant 19
More Hospitals for Xizang 20
Beijing Birth Weight Increase 20
Meeting on Malaria Prevention 20
Qinghai Supplementary Medicare Regulation 20

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Provincial Scientific Associations Promote Technology Activities
(Zhang Xiaosong; GUIZHOU RIBAO, 17 Oct 80) 21

Guidance Technology Expert Joins Beijing Aviation College
(Wu Zhuangzhi; GUANGMING RIBAO, 17 Nov 80) 24

PUBLICATIONS

Subject Indexes to 'WULI XUEBAO,' 'GAOFENZI TONGXUN,' 'DIWEN WULI'
(Various sources, various dates) 25

Annual Index
Index to 'GAOFENZI TONGXUN'
Index to 'DIWEN WULI'

Table of Contents of 'GONGCHENG JIXIE,' Jan, Feb, May, Jun 1980
(GONGCHENG JIXIE, Jan, Feb, May, Jun 80) 39

Issue No 1
Issue No 2
Issue No 5
Issue No 6

Table of Contents of 'WUHAN DAXUE XUEBAO, ZITAN KEXUE BAN' No 2, 1980. 47

Table of Contents of 'DIANZI JISHU,' Oct 80........................ 49

Table of Contents of 'HUAFEI GONGYE,' Oct 80 51

Table of Contents of 'DIANZI KEXUE JISHU,' Nov 80)........................ 53

ABSTRACTS

GEOLOGY

DIZHI XUEBAO /ACTA GEOLOGICA SINICA/ No 4, Nov 80........................ 55

GEOPHYSICS

DIQUI WULI XUEBAO /ACTA GEOPHYSICA SINICA/ No 4, Oct 80................ 61

NATIONAL DEVELOPMENTS

SCIENCE SYMPOSIUM PUTS PROPOSALS TO GOVERNMENT

OW091314 Beijing XINHUA in English 1240 GMT 9 Dec 80

[Text] Hefei, December 9 (XINHUA)--More than 500 delegates to a recent national science symposium here have proposed more active participation by scientists in the country's planning.

Among the proposals they put to the government are:

--That the state and provincial authorities establish advisory centers to help with policy and decision making.

--That a committee of specialists be set up to plan and submit to the government projects for China's scientific, technological and social development.

--That scientists and technicians have greater mobility and free choice of jobs.

--That the government give more money for science and education and encourage the development of talented people.

--That the State Scientific and Technological Commission should seek advice from specialists on improvements in the administration of the country's scientific programs.

--That academies and other higher learning establishments should train people for top administrative posts.

The eight-day symposium dealt with three scientific disciplines which have attracted much attention in China in recent years.

The subjects are the science of sciences (the study of the laws governing science and technology and their relationship to social phenomena--also known in the United States as the "sociology of science"), futureology and rencaiology (the study of making the best use of people with special training).

The scientists debated how these disciplines are related to social studies, economics, management, military affairs, education, medicine and planning of China's current drive for modernization. More than 300 papers were presented at the symposium.

The scientists also discussed the scientific methodology of policy-making, future problems likely to confront the Chinese Communist Party, and the education of gifted children, and the future composition of the country's leadership.

CSO: 4020

DIRECTOR OF ACOUSTICS INSTITUTE INTERVIEWED

OW220736 Beijing XINHUA in English 0720 GMT 22 Dec 80

[Text] Beijing, December 22 (XINHUA)--"China is at a big turning point. As a scientist, I'm confident and very optimistic about China's modernization," said 75-year-old Dr. Wang Dezhao, director of the Acoustics Institute of the Chinese Academy of Sciences, in an interview with XINHUA today.

This was a sober-minded analysis, he said and gave some recent work done at the institute to illustrate.

Under his guidance, researchers have made creative studies in sound propagation in shallow water. Five papers of the institute were cited by D. E. Weston, a well-known British acoustician, in a paper on international progress in the past 15 years in the study of acoustics. A special computer for sonar study, an acoustic alarm, an all-digital voice coder and an acoustic shot position indicator made by the institute are all among advanced world levels. The surface acoustic wave filter increases the pulse compression radar ranging area by 3.5 times and the resolution by 5 times.

Energetic and cheerful, Dr. Wang in recent years has gone to a number of international science forums, travelling to the Democratic People's Republic of Korea, Japan, France, Australia, Austria and Hungary.

In recognition of his scientific achievements, he was appointed in 1978 a member of the group of eminent scientists and technologists under the director general of UNESCO.

In the current drive to reform institutional management, Dr. Wang Dezhao has full authority over the management of the Acoustics Institute. A total of 33 research projects have been completed this year, of which 11 are of significant value for China's scientific development. "We are trying to modernize China's acoustics research," he said. He encourages the research staff to probe into the discipline's frontier areas.

Dr. Wang Dezhao's optimism as one of China's senior scientists, he said, was based on his view that "the Chinese Communist Party has vitality. The party itself is overcoming its own mistakes and the disaster caused by the ten years of the Cultural Revolution. China's hope lies here."

Dr. Wang studied in France in the late 1930's and worked in the National Center for Scientific Research and in the Paul Langevin Laboratory in Paris before he returned to China in 1956.

Despite his advanced age, he led a group of researchers on a science ship to the South China Sea this year, conducting China's first study of deep sea sound propagation. He plans to go to sea again next year for a follow-up study.

"After I returned to China the first thing I did was to train young scientists." Dr. Wang Dezhao hand-picked 100 university students in 1958 to be his postgraduate students. They now make most of the institute's research staff. Shang Erchang, one of his students and an associate research fellow now, has done successful research into underwater internal waves. This project drew favorable comments at the Tenth International Acoustics Congress in Sydney, Australia, last July.

Although his day is crowded with work, Dr. Wang sometimes relaxes in the evening playing the violin--"a life-long hobby"; or listens to his wife, Li Huinian, a retired vocal professor of the Central Conservatory, playing piano in the drawing room of their five-room flat. He does not miss many philharmonic concerts. "Music and acoustics are part of the same thing," he said with a smile.

CSO: 4020

ANHUI SCIENTIFIC, TECHNOLOGICAL ASSOCIATION CONGRESS ENDS

Congress Activities

Hefei Anhui Provincial Service in Mandarin 1100 GMT 26 Dec 80 OW

[Excerpt] The Third Congress of the Anhui Scientific and Technological Association closed on 26 December after a 5-day meeting. The meeting adopted a decision of the Third Congress of the Anhui Provincial Scientific and Technological Association as well as regulations on setting up scientific and technological associations in factories and mines and on organizing associations in the rural areas for the popularization of science there. The meeting put forward valuable proposals on environmental protection, energy, human resources and other issues. During the meeting, Vice Governor of Anhui Yang Jike made a speech on how to readjust the work of the association. Attending the closing ceremony were Su Yu and Lan Ganting, secretary and deputy secretary of the provincial party committee; Ma Changyan, vice chairman of the provincial people's congress; Meng Jiaqin, vice governor of Anhui; Nie Chunrong, secretary of the secretariat of the National Scientific and Technological Association, and leading members of the provincial military district and departments concerned.

Resolution Adopted

Hefei Anhui Provincial Service in Mandarin 1100 GMT 26 Dec 80 OW

[Excerpt] The Third Congress of the Anhui Scientific and Technological Association adopted a resolution on 26 December 1980. It says that the association will from now on promote academic exchanges at home and abroad; energetically popularize scientific and technological knowledge; discover, train and recommend technical personnel; and be an adviser to the party in the scientific and technological field. The resolution adds that the Scientific and Technological Association must truly represent the interests of all scientists and technicians, be concerned with their livelihood, work and study, and promptly reflect their demands. It appeals to all scientists and technicians throughout Anhui Province to rally more closely around the CCP and do their utmost for Anhui's modernization.

CSO: 4008

ELECTRONICS SOCIETY HOLDS NATIONAL CONGRESS

OW240305 Beijing XINHUA Domestic Service in Chinese 1413 GMT 23 Dec 80

[Excerpts] Beijing, 23 Dec (XINHUA)—The Chinese Electronics Society held the first national congress of activists in popularizing electronics science in Beijing from 18 to 23 December. The electronics society will, through this congress and other activities, promote the work of developing electronics science and technology in our country.

The Chinese electronics society and electronics societies in other places have made noticeable achievements in the past 2 or 3 years in helping amateur enthusiasts of electronics set up organizations to popularize electronics science and in disseminating knowledge of electronics science and technology. All this was accomplished through publications, documentary films and training classes and report meetings.

To exchange experience in the work of popularizing electronic technology, review achievements, commend the advanced personalities, formulate the electronic science popularization plan for 1981, further promote the work, the Chinese electronics society called this national congress of activists in popularizing electronic science. Participating comrades held that the popularization and application of electronics science and technology are most essential to the four modernizations. They pledged to make new contributions in promoting electronics science and technology.

Under the leadership and support of the Scientific and Technical Association of China a center for popularizing electronics science and technology has been set up and preparations are made for forming a national federation of electronics enthusiasts.

CSO: 4008

NATIONAL DEVELOPMENTS

BRIEFS

ELECTRONICS JOURNALS' COMMENDATIONS--Beijing 29 Dec (XINHUA)--The Chinese Electronics Society recently held a national meeting of activists who popularize electronics science. Two electronics journals--WU XIAN DIAN [RADIO] and DIAN ZI SHI JIE [ELECTRONICS WORLD]--were commended at the meeting. WU XIAN DIAN which began publication in 1955 now has 1.36 million subscribers. DIAN ZI SHI JIE, inaugurated in 1979, now has more than 700,000 subscribers. [Beijing XINHUA Domestic Service in Chinese 0209 GMT 29 Dec 80 OW]

ANHUI SCIENCE ASSOCIATION--The third committee of the Anhui Provincial Scientific and Technical Association held its first session on 27 December. The meeting elected the chairman, 10 vice chairmen and 40 standing committee members of the association. The chairman is (Yang Chengzong) and the vice chairmen are (Wei Ding), (Li Zhimin), (Zhang Ke), (Xu Yuangao), (Wang Qulie), (Chai Dengbang), (Geng Zhaolin), (Wang Jingcao), (Cai Bingjiu), and (Liu Zengdian). [Hefei Anhui Provincial Service in Mandarin 1100 GMT 28 Dec 80 OW]

GUIZHOU AWARDS CEREMONY--On the morning of 15 December, the Guizhou provincial people's government held the 1980 awards presentation ceremony in its hall. Citations, honorable certificates and bonuses were presented to units and individuals which scored a total of 210 scientific and technological achievements. Leading comrades of the provincial CCP committee, provincial people's congress standing committee, provincial government and provincial military district, including Su Gang, Xu Jiansheng, Wang Chaowen, Miao Chunting, Li Tinggui and He Ming, attended the gathering to congratulate them. Provincial Vice Governor Qin Tianzhen spoke at the gathering. These achievements were scored after the provincial rally on science and technology in 1978. The 210 prizes comprised one first prize, which won a bonus of 1,500 yuan, 15 second prizes each of which won a bonus of 1,000 yuan, 92 third prizes each of which won a bonus of 500 yuan, and 102 fourth prizes each of which won a bonus of 200 yuan. The total amount of the bonuses was 82,900 yuan. [HK251414 Guiyang Guizhou Provincial Service in Mandarin 2315 GMT 15 Dec 80 HK]

HEBEI SCIENTIFIC RESEARCH FORUM--Hebei Province recently held a forum on scientific research work in the universities, colleges and research units. The forum pointed out: At present, all universities, colleges and research units throughout the province should work together to promote scientific research. Li Feng, Hebei provincial vice governor, attended the forum and spoke. The forum also discussed orientations and key subjects of scientific research work in the province. [Shijiazhuang Hebei Provincial Service in Mandarin 0430 GMT 3 Dec 80 HK]

NEW SOCIETY FORMED--Chengdu, 18 Dec (XINHUA)--A national nuclear fusion and plasma physics academic report meeting was held recently in Chengdu. At the meeting, the China Nuclear Fusion and Plasma Physics Society was established. The first board of directors of the society was elected at the meeting. The board is composed of 43 directors, and Li Zhengwu [2621 2973 2976] was elected chairman of the board. Controlled nuclear fusion research began in our country in the mid-1950's. At present, a scientific research contingent has been formed, more than 20 types of small and medium-sized experimental devices have been made and research work has developed in two main directions--magnetic confinement and inertial confinement scientists presented more than 180 papers at the meeting which showed that controlled nuclear fusion research in our country has made new progress in theoretical, experimental and engineering fields. [Text] [OW181005 Beijing XINHUA Domestic Service in Chinese 0152 GMT 18 Dec 80]

RARE EARTH SOCIETY--The China Rare Earth Society was established on 5 December in Beijing. Zhou Chuandian, vice minister of metallurgical industry, was elected chairman of the board of the society. At the first academic meeting of the society, 173 academic papers were read and discussed. [OW091009 Beijing Domestic Service in Mandarin 1200 GMT 6 Dec 80 OW]

COUNTY SCIENTIFIC BODIES--Beijing, 28 Dec (XINHUA)--Nearly two-thirds of China's counties have established their county-level scientific associations, according to the conference on the work of county-level scientific associations held by the Chinese Scientific and Technical Association in Beijing from 17 to 24 December 1980. These county-level scientific associations are playing a role in local economic development. [Beijing XINHUA Domestic Service in Chinese 0333 GMT 28 Dec 80 OW]

JIANGXI SCIENTIFIC RESEARCH FORUM--The Jiangxi Provincial CCP Committee held a forum on scientific research on the afternoon of 29 November. Attending the forum were Ma Jikong, Di Sheng, Xu Qin and other comrades in charge of scientific research work. The Jiangxi vice provincial governor presided over the forum. Everybody freely aired their views and exchanged ideas on planned parenthood work, nurses training, education and agricultural production. [Nanchang Jiangxi Provincial Service in Mandarin 1100 GMT 30 Nov 80 HK]

SHANGHAI LASER STUDY--Shanghai, 5 Dec (XINHUA)--Shanghai's Fudan University and Shanghai Laser Technological Institute have established closer relations in helping each other in teaching and research. The institute has sent five researchers to the university to undergo training in basic courses. Meanwhile, necessary preparations have also been made by the institute to accommodate students from the university on experimental assignments. [Beijing XINHUA Domestic Service in Chinese 0209 GMT 5 Dec 80 OW]

GANSU INFRARED TELEVISION MICROSCOPE--The Pingliang Semi-Conductor Equipment Research Institute has produced China's first infrared television microscope. By applying the microscopic and infrared techniques, this infrared television microscope can instantly and accurately reveal through a television screen the internal condition and external defects of semiconductor equipment. [Lanzhou Gansu Provincial Service in Mandarin 1125 GMT 16 Dec 80 SK]

JIANGXI EXPERTS PROMOTION MEETING--On the morning of 18 December, Comrade Bai Dongcai presided over the meeting of the governor's work to listen to the report on promoting science and technology cadres to senior posts and to approve the promotion of 141 science and technology backbone elements. They were promoted to senior engineers, assistant research personnel, associate professors and doctors. The average age of these people is 53.8 years old. The oldest is 78 while the youngest is 41. These science and technology personnel have all made contributions in science and technology. The Jiangxi Provincial CCP Committee and the Jiangxi provincial people's government have paid very serious attention to promoting these people. [Nanchang Jiangxi Provincial Service in Mandarin 1100 GMT 21 Dec 80 HK]

SHANGHAI SCIENTIFIC RESEARCH--The scientific and technological associations in various wards and suburban counties in Shanghai and 23 academic societies and research institutes under the Shanghai Municipal Scientific and Technological Association have worked on many technical problems in connection with the four modernizations in Shanghai. They have organized more than 300 academic activities in 1980 and discussed such subjects as development of high-temperature water supply and use of residue heat in electric power generation. They made suggestions on acceleration of the development of urban gas supply, construction of an electric power station using tidal energy north of the estuary of the Yangtze River and construction of nuclear power plants in Shanghai and east China region. [OW301317 Shanghai City Service in Mandarin 2300 GMT 27 Dec 80 OW]

XINJIANG COMPUTER CENTER--An electronic computer center completed with all domestically produced equipment has been built in Urumqi Municipality, Xinjiang region. The center is built for meeting the needs of Xinjiang's developing scientific research projects. The computer can do 210,000 operations per second. The center was funded by the regional Scientific and Technological Commission with the assistance of the Xinjiang Physics Research Institute of the Chinese Academy of Sciences. [Urumqi Xinjiang Regional Service in Mandarin 1300 GMT 3 Jan 81 OW]

CSO: 4008

PHYSICAL SCIENCES

BRIEFS

ASTRONOMERS ON CLIMATIC CHANGES--Nanjing, December 20 (XINHUA)--Chinese astronomers have challenged the view that the lining up of the nine planets in the solar system expected within two years will give rise to major climatic changes and earthquakes. The planets will come into alignment on approximately May 15, 1982. The hypothesis that this will cause abnormal climatic changes on earth is "groundless," according to scientists at China's Zijingshan (Purple Mountain) Observatory in Nanjing. Activities of the moon and other planets affect the earth mainly through tide-raising force. Solar force accounts for 46 per cent of the earth's tide-raising force and that of all the other planets is very insignificant, the astronomers said. Even with all nine planets in line, their total tide-raising force is only 1.3-1000th of the solar force, so small that it cannot cause major climatic and seismological reactions, they said. The phenomenon will not cause exceptional solar activities either, they said. [Text] [Beijing XINHUA in English 0712 GMT 20 Dec 80 OW]

CSO: 4020

PRC MAKES OPTICAL FIBER USED IN COMMUNICATIONS

OW260623 Beijing XINHUA Domestic Service in Chinese 0333 GMT 25 Dec 80

[Text] Shanghai, 25 Dec (XINHUA)--Two key materials for optical fiber communications--multi-mode-and gradient optical fiber [duo mo ti du guang xian 1122 2875 2748 1653 0342 4960] of the phosphosilicon series and four- and six-core optical fiber cables--passed the quality test on 21 December in Shanghai and will soon be put into production and supplied to users. This marks a major step from scientific research to application in China's optical fiber communications technology.

These two materials are information-transmitting media in optical fiber communications. They are made by the Xinhu Glass Plant in Shanghai and the Shanghai Cable Research Institute of the First Ministry of Machine Building based on the research results of the Shanghai Silicate Chemistry Technology Institute of the Chinese Academy of Sciences. Their principal physical and mechanical properties are approximately the same as foreign products.

In ancient times man used beacon fires and courier horses as means of communications. With the invention of the telegraph and telephone in the 19th century, a new path was opened for modern communications. In the 1960's scientists began to use laser beams to transmit information through the atmosphere, thus creating a brand new technology--optical communications. In 1970 the United States made the world's first optical fiber from quartz glass. This was followed by the success of a series of optical communications experiments, which brought about a new revolution in communications technology. A single piece of optical fiber thinner than a hair can transmit hundreds of thousands of telephone messages simultaneously. Optical fiber communications, noted for wide application and strong resistance to interference, have advanced from the experimental stage to the application stage in some industrially developed countries.

In our country, research work in this regard began in 1974. Under the unified planning of the State Scientific and Technological Commission and the Ministry of Posts and Telecommunications, a cooperative project involving more than 40 research organizations, higher educational institutions and factories was organized in May 1978 by the Shanghai Municipal Scientific and Technological Commission. Through a year of efforts, a 1.8-kilometer experimental section for optical fiber communications, the first of its kind in our country, came into being. Testing has been satisfactory; the voice message transmitted are clear. This experimental section has now been included as a part of Shanghai's communication network.

Success in making the two key materials for optical fiber communications is a major step for China from scientific research to the application stage in optical communications technology. Meanwhile, new progress in this research field has also been made in Beijing, Wuhan and other places.

CSO: 4008

PRC INSTITUTE DEVELOPS LARGE COLOR TV CRYSTAL

OW220724 Beijing XINHUA in English 0715 GMT 22 Dec 80

[Text] Beijing, December 22 (XINHUA)--It is good news for color T.V. producers as an exceptionally big crystal has been produced by a laboratory of the Acoustics Institute of the Chinese Academy of Sciences here.

The lithium niobate crystal has a diameter of 100 mm, reaching advanced world levels.

"Such big crystals are being made only by a few countries such as the United States and Japan," said one scientist of the high frequency bulk wave laboratory.

The research group is headed by Shi Zhongjian, 44, an associate research fellow who has been working on the fundamental theories involved in crystal-making for the last ten years.

The crystal is used as a filter in color T.V. sets. Wide application of crystals is made in acoustics, radar, lasers, computers, electronics, nuclear reactors and space science.

The Bell Laboratory of the United States first reported its success in producing a lithium niobate crystal in 1966. The diameter then was 20 mm.

Shi Zhongjian and his colleagues began their research in 1970 and produced the first, 25 mm in diameter, in 1974. The diameter had been gradually enlarged in recent years from 50 mm to 75 mm.

The crystals produced by the acoustics laboratory are not only large in diameter but varied in shape. A French scientist who visited the laboratory said that he had never seen tube-shaped crystals such as they produce anywhere else in the world.

They are also trying to make spiral crystals which have the property of springs. "This is a valuable and new subject of research in crystallography," Shi Zhongjiang said. "It might lead to the making of some new high frequency bulk wave devices."

CSO: 4020

APPLIED SCIENCES

TECHNIQUE FOR PREVENTING LOSS OF SYNCHRONY BY ELECTRIC MOTORS DEVELOPED

Beijing GUANGMING RIBAO in Chinese 30 Nov 80 p 1

[Article by Sun Guanlong [1327 7070 7893]: "New Technique for 'Protection of Synchronous Electric Motors From loss of Synchrony and Under-Load Automatic Resynchronization' Developed"]

[Text] Since the new technique of "protection of synchronous electric motors from loss of synchrony and under-load automatic resynchronization" developed by Jiang Zongdao [5592 1350 6670] and other comrades of the Second Ministry of Machine Building was put into industrial operation in 1963, it has given 17 years of stable operation; it has excellent characteristics and has produced excellent technical and economic results, so that it is of great practical importance.

Synchronous electric motors are an important type of electrical equipment used extensively in chemical engineering, the oil industry, metallurgy, electric power, the coal industry, military engineering, light textiles, pharmaceuticals and other departments. They have one essential condition for normal operation, namely that their speed must be maintained in "strict synchrony" with the frequency of the power system. When external interference produces voltage or frequency fluctuations in the system, this synchrony may be disrupted and the motor may become out of synchrony. When loss of synchrony is mild, it may cause interruptions of production, and confusion in the manufacturing flow; when it is serious it may lead to breakdowns of the electrical equipment or other serious occurrences. In a petrochemical plant in Beijing, for example, a malfunction lasting 1.5 seconds threw all of the synchronous electric motors out of synchrony, and the resulting economic loss amounted to more than 1 million yuan. Accordingly, synchronous motors need suitable "synchrony protection equipment." Until now, more than 90 percent of our country's synchronous electric motors used 1940's and 1950's synchrony protection techniques and equipment, which lagged far behind the needs of modernized production. Starting in the 1960's, various countries exerted themselves to develop new-type synchrony protection technologies and equipment. Such research began rather early in our country, and successes were achieved and used in production rather early; since October 1960, when Comrade Jiang Zongdao began his research, he has carried out more than 400 simulation experiments and more than 150 on-site industrial tests, achieving gratifying results.

As of October of this year, this new technique was being used on several dozen synchronous motors of the various types used in production, which have been operating correctly for more than 10 years, increasing production safety and continuity and electrical supply reliability and avoiding the losses which would be produced by loss of synchrony. For example, on 24 February 1978 there was a malfunction in the electrical system of a certain plant in the Second Ministry of Machine Building, causing all of its synchronous motors to lose synchrony and stop, but because the new technique was used on the main production equipment, it assured continuous production by the plant in question, decreasing fund losses by a million yuan. On 15 January 1980 there was a malfunction in a certain chemical engineering plant in Shanghai, and the old system of synchronous motors which lacked the new technology all lost synchrony so that production by that system stopped entirely, causing an economic loss of 100,000 yuan; but because the new system was provided with the new technology, there was a smooth automatic under-load resynchronization of the motors, which assured safety and continuous production.

This new technique differs radically from older types of synchrony protection and is also different from techniques previously used abroad; it not only can guarantee safety of electrical machinery, but can also prevent it from stopping and assure continuous production, so that but technically and theoretically it embodies our country's unique approach and argumentation.

In order to disseminate this new technique, recently the Second Ministry of Machine Building decided to set up in its plant No 261 a "synchronous electrical machinery motor operating technology research service" to serve the various industrial departments.

8480
CSO: 4008

BRIEFS

FIRST CONGRESS ENDS--Tianjin, Dec 19 (XINHUA)--The China Institute of Communications, set up two years ago to study advanced telecommunications and sponsor academic exchanges, now has 23 branches with 6,485 members throughout China, with six more branches to be set up soon. This was announced by Wang Zigang, minister of posts and telecommunications, at the first national congress of the institute which concluded here today. Attending the congress were 290 delegates from the fields of posts and telecommunications, national defense, communications and education. Wang Zigang was elected president of the institute. The China Institute of Communications was established in May 1978. It was formerly called the China Posts and Telecommunications Society, and changed it's [as received] name in June this year. It publishes the magazines "TELECOMMUNICATIONS JOURNAL" and "MODERN TELECOMMUNICATIONS." [Text] [OW191242 Beijing XINHUA in English 1224 GMT 19 Dec 80]

ARCHITECTURAL SOCIETY CONGRESS--Beijing, Dec 21 (XINHUA)--The architectural society has called for designing graceful, comfortable and convenient buildings and houses and breaking with the monotonous building patterns which have prevailed in Chinese cities in recent decades. At the society's fifth congress, held recently in Beijing, a consensus emerged that Chinese architecture has suffered too much from restrictions and conventions. Architects at the meeting also criticized the practice of extravagant buildings for high leaders and foreign guests without considering the costs. Participants suggested that building patterns should be created to suit Chinese circumstances, drawing on advanced foreign experience where appropriate. However, they criticized the tendency of copying foreign designs blindly, and the idea that high buildings are synonymous with the modernization of architecture. Professor Yang Tingbao, a leading Chinese architect, was elected new president of the architectural society. Founded in 1953, the society now has 17 academic committees covering such areas as design, city planning, architectural structures, architectural construction, gardening and tree planting. [Text] [Beijing XINHUA in English 0141 GMT 21 Dec 80]

SHANGHAI AUTOMATIC DIALING--New service of automatic dialing for long-distance phone calls was started in Shanghai City on 16 December. The business department of Shanghai Long-Distance Telephone Bureau will handle calls from Shanghai to those in Beijing, Tianjin and Nanjing whose telephone numbers are registered. Calls can be made by directly dialing the numbers without going through the long-distance telephone operators. [Shanghai City Service in Mandarin 2300 GMT 15 Dec 80]

CSO: 4008

IMPROVEMENT IN CARE FOR RURAL CHILDREN REPORTED

OW240837 Beijing XINHUA in English 0815 GMT 24 Dec 80

[Text] Zhengzhou, December 24 (XINHUA)--Results of a three-year program of improvement of health conditions among 140,000 rural children under the age of 7 in 14 provinces, 3 municipalities and 2 autonomous regions are summed up here at a recent meeting attended by some 200 leading pediatricians and health bureau directors. The efforts are a strong support for the country's call for "one child for a couple," the participants said.

The Institute of Pediatrics started this campaign in 1977 as part of a national health program. The first stage of the work covers:

--raising the standard of rural barefoot doctors through short training courses;

--regular prenatal and newborn baby care;

--establishing pediatric clinics;

--better control of infectious diseases through preventive injections.

As a result, infant mortality has dropped. A general increase in height and weight has been recorded, and 50 percent less children are suffering from rickets and malnutrition, according to the institute's report.

Two hundred million Chinese children live in rural areas. Health check-ups among rural children organized by the institute in 1977 showed that they were less strong in physique than city children. A 1974-1976 analysis from 12 provinces and cities reported that new-borns made up about one-fourth of the total deaths of children under seven.

CSO: 4020

RESEARCHERS INCREASE KNOWLEDGE OF STOMACH CANCER

OW191250 Beijing XINHUA in English 1227 GMT 19 Dec 80

[Text] Beijing, December 19 (XINHUA)--A large-scale two-year investigation in selected rural areas of China inhabited by 19 million people has given Chinese cancer researchers new insight into the epidemiological factors and possible causes of one of the country's most threatening illnesses --stomach cancer.

The investigation, which covered more than 100 people's communes in 12 counties, shows that mouldy food, bad eating habits, smoking, alcohol drinking, smoked food and a high-salt diet are "dangerous factors" which may lead to stomach cancer, according to Professor Zhang Rufu of the Beijing Cancer Institute. Fresh vegetables, animal protein and vegetable oil can be regarded as "safe factors," said Professor Zhang, one of the leaders of the survey.

However, he added, dietary and environmental factors alone cannot explain why China's stomach cancer rates vary so greatly among groups of people living in the same conditions and following similar eating patterns. The crucial factor, investigators believe, is a stomach ailment known as "atrophic gastritis," which inflames the membranes of the stomach.

The investigators found that 30 percent of the people in high-risk stomach cancer areas are suffering from all kinds of chronic stomach diseases, and predominantly atrophic gastritis. This ailment is generally found among people aged 10 to 15 years younger, on the average, than those suffering from stomach cancer. Since scientists found a clear correlation between the morbidity rates of atrophic gastritis and the death rate of stomach cancer, adjusted for age, they have concluded that atrophic gastritis is probably an incubator of the cancer.

Much of the investigation focused on the implications of the presence of nitrite in patients with chronic stomach diseases, the result of bacterial action on environmental nitrate taken in food and water. Professor Zhang said it appears that atrophic gastritis creates favorable conditions for the synthesis of a carcinogenic nitroso compound in the stomach.

The amount of nitrate in the water supplies of high-risk stomach cancer areas was found to be generally higher than in low risk areas--but more strikingly, the amount of nitrite in the gastric juices of chronic gastritic patients in high risk areas was found to be exceptionally higher than that of such patients in low risk areas.

Cigarette smoking and eating fungus-contaminated food will compound the risks, the study found. The fungus contamination of foodstuffs is serious in all places chosen for the investigation, the investigators found. But the predominant toxin-producing fungus in the fasting gastric juice of chronic stomach disease sufferers is aspergillus versicolor which is found much more in atrophic gastritic patients in high risk areas than those in low risk areas.

Investigators also discovered high levels of nickel, selenium and cobalt and a close ratio between calcium and sulphate levels in the soil and water of high-risk areas. These also may be related to the incidence of stomach cancer, they believe.

The investigation was a cooperative effort by the Beijing Institute of Cancer Research and 30 regional medical institutions, involved medical workers in the fields of epidemiology, chemistry, mycology, pathology, pathophysiology and clinical medicine.

Its focus was China's most prevalent kind of malignant tumor. A previous retrospective survey shows that of some 800,000 Chinese who die of cancer each year, nearly 200,000 are victims of stomach cancer.

Professor Zhang said that although the results of the investigation are preliminary, they may help guide the country in preventing and lowering the incidence of stomach cancer. "Our investigation is just an effort to solve the problem, but it's the first of its kind," he said.

CSO: 4020

LIFE SCIENCES

BRIEFS

BIO-MEDICAL ENGINEERING SOCIETY--Beijing, 27 Nov (XINHUA)--The China Society of Bio-Medical Engineering has been set up after a 5-day meeting here, the GUANGMING DAILY reports today. Professor Huang Jiasi, president of the Chinese Academy of Medical Sciences, was elected chairman of the 49-member council of the academic organization. Bio-medical engineering is a new discipline which incorporates basic science, engineering technology and the study of human and animal organs and functions. A total of 370 dissertations and papers were presented at the meeting which ended on 24 November. They dealt with such subjects as material for medical use, bio-effects, bio-mechanics, artificial organs, medical instruments, ultra-sound and laser devices, information control and signals processing. [Beijing XINHUA in English 0725 GMT 27 Nov 80 OW]

GUANGXI MINORITY MEDICAL CLASSES--Nanning, 23 Nov (XINHUA)--Four secondary medical schools in south China's Guangxi Zhuang Autonomous Region have set up classes specially for students of minority nationalities. This is a new step taken by the region to train medical workers for the minority peoples who comprise 37.7 percent of its population. Two years ago a medical college for minority nationalities was established in Youjiang Prefecture. Three hundred junior middle-school graduates were enrolled in the new classes in the Bose, Liuzhou, Nanning and Hechi medical schools this year. The students are of the Zhuang, Miao, Yao, Dong, Gelao, Mulao, Maonan, Hui, Jing, and Yi nationalities. The new medical students will study 4 years in 2 disciplines, general medicine, and maternity and child care. They enjoy free tuition, lodging, food and medical treatment, and are provided with textbooks, clothes, shoes and other daily necessities. Upon graduation they will return to their own areas, where they will serve in county or commune medical units. [Text] [OW251525 Beijing XINHUA in English 0714 GMT 23 Nov 80 OW]

GUANGXI MEDICINAL PLANT--Nanning, November 15 (XINHUA)--Four new varieties of Maytenus, a plant with anti-carcinogenic properties, have been discovered in south China's Guangxi Zhuang Autonomous Region. The new varieties were found by members of the Guangxi Medicine Research Institute during a recent survey of a dozen counties in central and southern Guangxi. An evergreen plant, Maytenus grows luxuriantly in a warm and humid climate. Three anti-cancer components, Maytencin, Maytenpulin and Maytenpirin, have been extracted from the Maytenus plant and have been on animals to some effect. [as published] [Text] [OW161023 Beijing XINHUA in English 0700 GMT 15 Nov 80 OW]

MORE HOSPITALS FOR XIZANG--Lhasa, January 1 (XINHUA)--Tibet now has 19 city hospitals, more than 70 county hospitals and clinics in 90 percent of rural districts and communes, Tibetan authorities said this week. The region has nearly 3,500 doctors of Tibetan nationality and more than 1,000 Tibetan medical students have studied in Beijing, Shanghai and other cities. [Text] [Beijing XINHUA in English no time given 1 Jan 81 OW]

BEIJING BIRTH WEIGHT INCREASE--Beijing, 13 Dec (XINHUA)--The average weight of new-born infants has been rising over the past few decades, it was stated today by the Pediatrics Institute under the Chinese Academy of Medical Sciences. A survey conducted in the Beijing Maternity Hospital showed that the average birth weight of male infants is now 3.36 kilograms and that of female infants 3.26 kilograms. Earlier surveys in the urban districts in Beijing showed that in 1937, average male birth weight was 2.15 kilos and 3.09 for the female. In 1954, the corresponding averages were 3.27 and 3.21. Dr Wang Xiaoduan, director of the obstetrical department of the Beijing Maternity Hospital said that 70 percent of the infants were first-born because many Chinese families intend to have only 1 child. Gynecologists held that the tendency was connected with better prenatal care, hospital hygiene and special attention to high-risk pregnancies. The Beijing Maternity Hospital, beginning this year, has opened consultation service for high-risk pregnancies. [Text] [OW180643 Beijing XINHUA in English 0741 GMT 13 Dec 80 OW]

MEETING ON MALARIA PREVENTION--According to our source, the Shandong Provincial Experience Exchange Meeting on Preventing and Curing Malaria was held in Jinan from 16 to 21 December. After analyzing this year's malaria trends, the meeting set forth targets and measures for preventing and curing the disease in 1981. It urged leaders at all levels in the malaria-contracting areas to deal with this disease and to help malaria patients. They also called for campaigns on preventing and destroying mosquitoes. In malaria-stricken areas, efforts should be made to examine all people and give them necessary treatment. During malaria season efforts should also be made to give preventive inoculations or medicines to all people. The meeting also called for efforts to keep an eye on the development of this disease and to adopt effective preventive measures. Huang Shuze, vice minister of the Public Health Ministry, attended and addressed the meeting. He called on our province to consider preventing and curing malaria as an important task in disease control and to provide all necessary financial and manpower support. [Text] [SK250836 Jinan Shandong Provincial Service in Mandarin 2300 GMT 24 Dec 80]

QINGHAI SUPPLEMENTARY MEDICARE REGULATION--The Qinghai Provincial Financial and Public Health Departments jointly issued a supplementary regulation on the management of free medicare on 13 October. The regulation will become effective 1 January 1981. Station reporters recently called on the free medicare office of the provincial public health department asking a responsible comrade to explain the regulation. He said that during the last 17 years from 1963 to 1980 there has been no unified standard or regulation governing the management of the various medicare units, causing great waste of state funds. The new regulation does not differ significantly from the previous one. According to the new regulation, the annual per capita quota for free medicare is 30 yuan, an increase of 12 yuan over that provided in the current regulation. The regulation also provides that hospitals should make the best use of medicine available to them in writing prescriptions. If they have to use a certain medicine that is in short supply, they should purchase it for patients. [SK010009 Xining Qinghai Provincial Service in Mandarin 2330 GMT 29 Nov 80 SK]

CSO: 4008

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

PROVINCIAL SCIENTIFIC ASSOCIATIONS PROMOTE TECHNOLOGY ACTIVITIES

Guiyang GUIZHOU RIBAO in Chinese 17 Oct 80 p 1

[Article by Zhang Xiaodong [1728 2556 2639]: "All Levels of Provincial Scientific Associations Promote Science and Technology Activities"]

[Text] All levels of scientific associations and affiliated academic organizations are actively promoting science and technology activities and contributing to the advancement of scientific and technological standards in Guizhou and toward stimulating production and development.

Since its recovery in 1978, the provincial scientific association has added new committee members and strengthened its leadership and administrative structures to meet the working and developmental requirements of the new period. In the past 2 years, there has been considerable progress in all levels of scientific associations in the province and in their affiliated academic societies. To date, there have been 46 academic societies, research societies and associations reinstated or newly founded, 13 provincial level societies are being organized, and the combined membership has exceeded 12,000. Scientific associations have been reinstated or started in 35 prefectures, municipalities, counties and regions.

There has been participation by numerous science and technology workers in various academic activities in science development, in counseling and planning, and in proposing a number of scientifically-based recommendations geared toward vital and urgent topics in the four modernization construction of Guizhou. The provincial science association has also published an internal periodical called "Recommendations by Science and Technical Workers," 19 issues in print so far, to encourage proposals and suggestions from the scientific and technical staff. Practical recommendations based on actual experience of production and construction in Guizhou have been published in this periodical and received attention from provincial leaders and various departments. Some suggestions have been adopted.

Academic activities in Guizhou have been progressing vigorously over the past 2 years. Provincial societies have organized over 1,300 academic exchange meetings with more than 3,500 papers presented. Among these, 900 articles of higher quality have been selected and presented at national academic meetings. Last December, an agricultural science and technology forum was jointly held by the provincial scientific association, the provincial committee on agriculture and the provincial committee on technology. In this interdisciplinary meeting more than 50 specialists from 22 societies participated in the penetrating discussions on topics of how to expedite agricultural developments in Guizhou. Over 100 beneficial suggestions that were proposed in the meeting have provided a positive effect in promoting provincial agriculture. In the many activities of academic societies, attention was given not only to the exploration and exchange of basic theories but also to problems centered around production. The science and technical workers have been called upon to conquer the bottlenecks in production.

In March 1980, the provincial highway society held a work conference on the Liberation automobiles. In this meeting the society secretary Yang Shouyue [2799 1343 1471], provincial transportation office engineer Liu Tzudian [0491 5261 3329] and their colleagues proposed a technical improvement plan to counter the problems of impaired engine power and reduced transportation efficiency of Liberation automobiles due to the high altitude of Guizhou. This plan will allow the Liberation CA-10B automobile to increase its capacity from 4 tons to 5 tons and 3 tons of trailer load. Technical personnel at the meeting studied the theoretical calculations and design principles of this proposed plan and performed on-site road tests. The plan was proved successful and the society therefore recommended to the transportation office that this plan be publicized in the province. Implementation experience showed an improved automobile power from the original 68.1 horsepower to 90.37 horsepower and gas consumption was reduced by 15 percent. This achievement has made a considerable contribution to the transportation industry in Guizhou.

Various levels of provincial science associations and affiliated societies have also conducted a variety of workshops, learning classes and training sessions to help raise the quality of the technical staff and to train the necessary manpower required in the four modernization movement. Statistics show that within the last year provincial societies have conducted 44 training classes and educated more than 2,800 people. The societies have also taken every opportunity to invite national experts to come to Guizhou for lectures and invited technical reports from foreign specialists who have come to assist our work, to travel or to visit relatives. They have also invited Guizhou scientists and technical people who had attented international conferences to report on the activities in foreign nations. All these efforts are aimed at providing a favorable atmosphere for the learning of advanced scientific technology.

Substantial efforts have been made by the various provincial scientific associations and technical societies in the dissemination of science knowledge. Science dissemination activities in Guizhou have been stepped up even more after the Party Central Committee issued the call for the "advancement of the scientific and cultural level of the entire Chinese nation." Since last year, all levels of scientific associations and academic societies have conducted 520 science-dissemination lectures to an audience of 160,000 and provided 5,800 showings of science education movies to an audience of 1.8 million. Science dissemination picture halls, wall posters and library reading rooms have been set up at a number of locations and they are well received by the masses. In coordination with various departments the provincial science association has also provided science and technology lectures to the leadership cadres in Guizhou and has had a positive influence on the learning of science by cadres at different levels. After the formation of the organization committee for the provincial association on creative activity in science dissemination, the committee has been actively promoting workers in science, technology, literature, and art to create literature and art for the popularization of science. In addition to starting a new journal called POPULAR SCIENCE, the committee has also worked closely with newspapers, radio stations and publishers in its efforts to popularize knowledge of science. For the youths, a variety of lively science educational activities have been coordinated by science associations, education and athletic departments and the Communist Youth League. Science and technology groups have multiplied in many high schools and elementary schools in Guizhou. Under the guidance of teachers and with the assistance from councils of the science and technology counseling associations, a vast youth population is engaged in science learning and creative and competitive activities. A healthy atmosphere of learning science, loving science, and using science has been established among the youths.

9698
CSO: 4008

GUIDANCE TECHNOLOGY EXPERT JOINS BEIJING AVIATION COLLEGE

Beijing GUANGMING RIBAO in Chinese 17 Nov 80 p 2

[Article by Wu Zhuangzhi [0702 1104 1807]: "Beijing Aviation College Hires Wen Qixiang [3306 0796 4382] as Part-Time Professor"]

[Text] Famous Chinese expert on guidance technology Wen Qixiang [3306 0796 4382] was recently hired by Beijing Aviation College as a part-time professor.

Wen is currently a guidance technical advisor of the Fourth Ministry of Machine Building at the 1020 branch of its 10th Institute. He also holds such posts as standing trustee of the Chinese Institute of Electronics and committee chairman of the Guidance Society, Chinese Institute of Electronics. Wen Qixiang is one of the earliest workers in China to engage in the guidance enterprise. For over 30 years he has helped China establish a complete guidance system. He organized and administered research institutes and plants for guidance technology and is responsible for the development, design and production of numerous engineering projects and satellite guidance facilities. He provided accurate data and crucial services for the Chinese fleet in their successful completion of testing, monitor and recovery missions during the launch of carrier rockets. Wen has also translated over 30 articles including "Satellite Guidance System," "Landing Guidance," and "Communication, Guidance and Identification System." Among Wen's many technical and academic publications are: "Development of Radio Guidance Technology," "Development in Guidance Technology," and "Current Development Status of Electronic Guidance Technology."

9698
CSO: 4008

SUBJECT INDEXES TO 'WULI XUEBAO,' 'GAOFENZI TONGXUN,' 'DIWEN WULI'

Annual Index

Beijing WULI XUEBAO in English Vol 29,No 12, 1980 pp viii-back cover

[Following is annual index arranged by broad category of Chinese scientific journal WULI XUEBAO [ACTA PHYSICA SINICA] for calendar year 1980]

No. 1

The Characteristics of Epitaxial p-n Junctions Grown by Method of Silicon Carbide Crystals Sublimation ······ *Feng Xi-qi, Luo Bin-zhang* (10)

On the Facets and Twin Formation in the Growth of InSb Single Crystals ······ *Yu Zhen-zhong, Jin Gang, Chen Xin-jiang, Ma Ke-jun* (18)

Anomalous Impurity Segregation in InSb Single Crystals ······ *Yu Zhen-zhong, Jin Gang, Chen Xin-jiang, Ma Ke-jun* (24)

A Crystallographic Investigation on the One-Dimentional Transition Phase β'_1 in an Aged Mg-Zn Alloy ······ *Su Qian-wu, Xu Shan-sheng* (34)

Quantitative Determination of Spectral Purity of X-ray Tubes for Diffraction Analysis ······ *Guo Chang-lin* (45)

Enhanced Plasma-Frequency Radiation in Tokamaks ······ *Wu C. S., Xia Meng-fen, Zhou Ru-ling, Kang Shou-wan, Cai, Shi-dong* (53)

Spectral Properties of Nd^{3+} in Glass ······ *Chen Shu-chun, Qi Chang-hong, Dai Feng-mei* (63)

Structure and Stability of Polytropic Fluid Spheres with Negative Index within the General Relativistic Theory ······ *Chu Yao-quan, Chen Fu-shen, Feng Li-zhi* (72)

The Long Time Asymptotic Behaviour of the Correlation Functions——The Influences of the Waves on the Relaxation Processes ······ *Ho Yu-ping* (92)

The Diffusion Theory of Outgassing of Some Non-crystal Materials in Vacuum ······ *Gao Ben-jun, Xue De-tong* (105)

Research Notes

The Free Boundary Solution to the Equation of Plasma Magnetohydrodynamic Equilibrium with Axisymmetry and Non-circular Cross-section ······ *Qing Cheng-rui, Zhou Yu-mei* (110)

Holographic Concave Grating Monochromator ······ *Jiang Ya-guang, Song Cong-long* (116)

Flux Growth of GGG Crystals and Determination of the Nucleation Temperature ······ *Liu Ji-zhe, Jin Tong-sheng, Liu Gong-jiang* (121)

A Preliminary Study on the Relaxation of Si (111) Surface Atoms ······ *Zhang Kai-ming, Yeh Ling* (126)

Superconducting Critical Fields of Type A and Type B Superconductors ······ *Zhang Yu-heng, Cao Xiao-wen* (130)

Anomolous Patterns of Tungsten Samples Observed with Scanning Electron Microscope ······ *Liao Chun-chu, Wang Yun, Wang Hong-jun, Lan Fen-lan* (137)

No. 2

The Stochastic Models for Non-Equilibrium Systems and Formulation of Master Equations ······ *Yan Shi-tian, Li Zhan-bing* (152)
Unitary Transformation and General Linear Transformation by the Optical Method (IV) ······ *Ho Yu-ping* (160)
Determination of the Size Distribution of Atmospheric Aerosols by Means of Measurement of Optical Attenuation ······ *Tao Rong-jia* (172)
Peculiarities Exhibited by Aluminium-Silver Alloy in the Process of Fatigue Loading ······ *Wang Zhong-guang, Xia Yue-bo, Huang Yuan-shi, Ge Ting-sui (Kê T. S.)* (181)
The Crystal Structure of (Ni, Co),Al, in the Al–Ni–Co Ternary System——A New Vacancy Controlled Alloy Phase ······ *Lu Xue-shen (S. S. Lu), Li Fang-hua* (198)
Electron Diffraction Investigation of amorphous Gd-Co Alloy Films ······ *Li Fang-hua, Wang Yin-jun, Gao Jun-jie, Teng Chen-ming, Chang Long-cun* (204)
An Electron Transport Theory of the Cavity Ionization ······ *Lou Zheng-ming* (213)
On the Low Frequency Drift Wave and the Pseudoclassical Diffusion ······ *Zhang Cheng-fu* (224)
The Longitudinal Resistivity of a Magnetized Plasma ······ *Cai Shi-dong (S. T. Tsai), Wu Jing-sheng (C. S. Wu)* (232)
A Variational Principle for the Equilibrium of a Free-Boundary Plasma ······ *Wang De-yu* (240)
Formation of Hard Bubbles under Bias Pulse Field ······ *Liu Ying-lie, Nie Xiang-ju, Han Bao-shan* (246)

Research Notes

Determination of X-Ray Powder Diffraction Data for Sodium Strontium Barium Niobate System ······ *Guo Chang-lin* (251)
An Investigation of Divalent Iodates and Their Complex Salts ······ *Liang Jing-kui, Yu Yu-de, Ding Shi-ling* (256)
Thermal Neutron Inelastic Scattering of Palladium Hydrides (PdH_x) ······ *Chen Gui-ying, Cheng Zhi-shuh, Wu Shan-nan, Kuan Jing-hui* (257)
Theory of Higher Order Chromatic Aberrations ······ *Xue Ming-qiu, Lin De-yuan* (264)
Defects Etching Pits Observations and Analyses on Epitaxial Silicon Cleavage Surface ······ *Cai Tian-hai* (269)
An Empirical Equation for Optical Orientating Crystals with Large Optical Axis Angles ······ *Xiao Chao-liang* (272)

No. 3

A Graphic Determination of the Drift Constants in Debye-Scherrer Photographs and the Accurate Evaluation of Lattice Constants ······ *Lu Xue-shan* (285)
Measurement of Minute Radiometric Quantities in the Spectral Range from Visible to Near Infra-Red ······ *Zheng Jian-sheng* (295)
On the Uniformity of the Illumination-Distribution on the Window of an Integrating Sphere ······ *Li Ya-mu* (301)
Generation of Phase Conjugated Backward Wave by Degenerate Four-Wave Mixing in Chlorophyll Solution ······ *Wu Cun-kai, Fan Jun-yin, Wang Zhi-ying* (310)
The Critical Velocity of Runaway Electrons in a Magnetized Plasma ······ *Kang Shou-wan, Cai Shi-dong* (319)
The Slowing Down-Diffusion of α Particles in Fusion Plasma ······ *Ho Yu-kun* (327)
The Ion Optical Properties and Second Order Aberration of the Crossed Toroidal Electric and Inhomogeneous Magnetic Fields as a Mass Spectrometer ······ *Ximen Ji-ye* (340)
X-Ray Topographic Study of Dislocations and Stacking Faults in Silicon Web Dendrites ······ *Yang Chuan-sheng, Jiang Xiao-long, Xu Shun-sheng* (353)
Low Frequency Internal Friction of Iron in the Process of Plastic Deformation ······ *Zhang Jin-xin, Ou Guang-lian, Hu Yin-yun* (364)
A Comment on the Composite Quantized Field Theory and Bound States ······ *Wang Rong* (373)

Research Notes

X-Ray Diffraction Topographic Study of Crystal Defect in $LiNbO_3$ ······ *Zhou Heng-nan, Jiang Shu-sheng* (379)

A Revision on Rensch's Finite Difference Method for Calculating the Field Distribution in Resonators
······ *Wu Zhong-xiang* (382)
Anomalous Behavier of Striped GaAs DH Lasers at Low Temperature ······
······ *Dai Shou-yu, Qi Shang-xue, Li Zhao-lin, Zhou Pei-zhen, Tao Hong-jie, Wang Chang-heng* (388)
Dielectric and Pyroeletric Properties of Single Crystal TGS Grown by the Method of Changing Solvent
······ *Deng Zhao-de, Shao Shi-ping, Liang Hong-lin* (391)
Radiation Density in Laser Cavity Calculated by Field Strength Superposition ······ *Wu Zhong-xiang* (394)
Planck Length and the Five-Dimensional Principal U_1-Bundle Theory Unifying Gravitation and Electromagnetism ······ *Wu Yong-shi* (399)
The Internal Bias Field of TGS Single Crystal ······ *Zhu Zhong-quan, Lu Hui-ru* (405)
Pulse Width Measurement ot the Passively Mode-Locked Nd: YAG Laser by Noncollinear SHG Method
······ *Lin Jin-gu, Liu Cheng-hai, Zhu Zhen-he, Lai Rui-sheng, Huo Chong-ru* (408)

No. 4

An Approximate T_c Formula of Type A Superconductors (I) ······
······ *Wu Hang-sheng, Zhou Zi-fang, Wang Zhong-yan, Zhang Xi-xiang* (418)
Electronic Impact Excitation of Lithium-like Ions ······ *Li Jia-ming (C. M. Lee)* (428)
Continuously Turnable Laser from Infrared to X-Ray Region by Using the Relativistic Doppler Effect of High Energy Ion Beam in Negative Temperature State ······ *Li Fu-li* (438)
A Six-Beam High Power Neodymium Glass Laser ······ *Xu Zhi-zhan, Li An-ming, Chen Shi-shen, Lin Li-huang, Liang Xiang-chun, Ouyang Pin, Yin Guang-yu, Hou Shing-fa* (446)
An Optimal Selection Method on Starting Reflexion Set in Direct Method ······ *Zheng Qi-tai* (453)
Relaxation Behaviors of the Depolarization Current and the Apparent Dielectric Constant of α-$LiIO_3$ Single Crystals ······ *Zhu Yong, Zhang Dao-fan* (460)
A X-Ray Study of Imperfection in Synthetic Fluorophlogopite Crystal ······
······ *Kuo Chang-lin, Huang Yue-hong, Fan Shi-ji* (468)
A X-Ray Investigation of the Manganese-Gallium System ······
······ *Lu Xue-shan (S. S. Lu), Liang Jing-kui, Shi Ting-jun, Zhou Min-giang* (483)
The Quantitative EDS Analysis of the Constituents of Binary Alloys Without Standard Samples ······
······ *Wu Zi-qin, Gao Qiao-jun, Ge Sen-lin* (493)
A TEM Study of Partial Dislocations in A Nickel-Chromium Alloy ······ *Guo Ke-xin, Lin Bao-jun* (499)

Research Notes

Interaction of High Intensity CO_2 Pulsed Laser with Target in Air ······
······ *Fu You-shou, Xia Sheng-jie, Wang Chun-kui, Wu Bao-gen* (507)
Measurement of Third-Order Susceptibility by Degenerate Four-Wave Mixing ······
······ *Wu Cun-kai, Wang Zhi-ying, Fan Jun-yin* (510)
The Anomalous Properties in Viscosity Near $N \rightarrow S_A$ Transition Point of Liquid Crystals ······
······ *Feng Ke-an* (516)
The Temperature Dependence of the Frankel Exciton Effective Mass ······ *Xu Shih-wei* (523)
A $P(2\times2)$ Structure Formed by the Adsorption of Nitrogen on Ni (001) Surface ······
······ *Li Ri-sheng, Tu Li-xun* (528)
A Simple Method of Removing Residual Carbon for Preparing Clean Nickel Surface ······
······ *Li Ri-sheng, Zhang Wen-ling, Xie Tian-zheng, Sun Yu-zhen* (532)

No. 5

The General Types of Multiple Solution in Patterson Method for Low Symmetry Systems ······
······ *Zheng Qi-tai* (556)
An X-ray Investigation of the Co–Ga Binary System ······ *Lu Xue-shan, Liang Jing-kui, Zhang Dao-fan* (565)
Impurity out-Diffusion Model in Recrystallization of Amorphous Layer due to High Dose, Ion Implantation ······ *Xia Yue-Yuan* (576)
CT-6 Tokamak Research (I) ······
Group 104, Institute of Physics, Group 403, Institute of Electrical Engineering, Academia Sinica (587)
A High Efficiency Stimulated Raman Scattering Source ······ *Wu Cun-kai, Fan Jun-yin, Wang Zhi-ying* (593)
Influence of Orientations on Thermally Induced Birefringence in YAG: Nd Crystals ······
······ *Zhou Liang-zhi, Zhang Shan-shan, Zhang Shou-du* (601)

The Absorption Spectrum and Quantum States of Neodymium Ion (Nd^{3+}) in Single Crystal of Anhydrous Neodymium Chloride and Anhydrous Prasedymium Chloride ······ *Song Zeng-fu, Zhang He-yi, Xu Yao-zhou, Luo Zhen-gi, Jian Hong-zhong, Xi De-fa, Wang Tai-fu, Liang Min-ji* (608)
The Temperature Dependence of the Polaron Effective Mass ······ *Gu Shih-wei* (617)
On the Goldstone Mode in the Stationary State of a Non-Equilibrium Dissipative System ······ *Zhou Guang-zhao, Su Zhao-bing* (634)
The Spin Wave Theory of a Heisenberg Ferromagnetic System with Biquadratic Exchange Interaction at Low Temperatures ······ *Tao Rui-bao, Pu Fu-cho* (643)
A Method of Measuring Tensor Susceptibility and Effective Linewidth ······ *Liao Shao-bin, Yin Guang-jun, Liu Jin, Zhou Li-nian* (650)

Research Notes

Study of Dislocation Etch Pits on $PbFe_{12}O_{19}$ Single Crystals ······ *Liu Ji-zhe* (657)
On the Absence of the Phase Transition in a Low-Dimensional Magnetic System with Multi-Quadratic Exchange Interactions ······ *Tao Rui-bao, Pu Fu-cho* (660)
Lithium Ionic Conductivity of LISICON Single Crystals ······ *Chen Li-quan, Wang Chang-qing, Wang Lian-zhong, Xiao Chao-liang, Bi Jian-qing* (666)
Gravitational Mass Defect in Reissner-Nordström Metric (with Conservation of Charge) ······ *Xu Chong-min, Zhu Shi-chang* (672)
Ellipsometric Spectra of SiO_2 Films on Silicon ······ *Mo Dang, Chen Shu-guang, Yu Yu-zhen, Huang Bing-zhong* (676)

No. 6

Superconducting T_c and Heterogeneous Hybridization in Close-packed Compounds ······ *Yin Dao-le, Zhang Li-yuan* (685)
The Surface Structure of GaAs (110) ······ *Zhang Kai-ming, Ye Ling* (692)
The Determination of the Generation Lifetime and Surface Generation Velocity by the Linear-Sweep MOS-CV Method ······ *Bao Zong-ming, Su Jiu-ling* (697)
Motion of Isolated Dislocations in Silicon Crystals ······ *Ba Tu, He Yi-zhen* (705)
The General Form of Multi-Solution in Patterson Method for Low Symmetric System (II) ······ *Zheng Qi-tai, Fan Hai-fu* (710)
X-Ray Topographical Study on Defects in α-$LiIO_3$ Decorated by Space Charge due to the Applied DC Fields ······ *Gu Yuan-xin, Ge Pei-wen, Zhao Ya-qin, Hu Bo-qing, Wu Lan-sheng, Fu Quan-gui* (717)
A Statistical Theory of Brittle Fracture ······ *Xing Xiu-san* (731)
The Visible Fluorescence Dynamics of BCl_3 Induced by High-Power Infrared Laser Radiation ······ *Xu Ji-ren, Jiang Yi-feng, Huang Nan-tang, Lin Guang-hai* (742)
The Dissociation Model of Polyatomic Molecule Induced by Infrared Laser Field ······ *Gan Zi-zhao, Yang Gao-zhen, Huang Xi-yi, Feng Ke-an* (755)
The Thermo-Optic Effect of an Optical Element in Laser Resonator ······ *Ye Bi-qing, Ma Zhong-lin* (763)
CT-6 Tokamak Research (II) ······ *Group* 104, *Institute of Physics, Academia Sinica* (777)
The Effect of Finite Ion Larmor Radius on the Eigenmodes of Drift Wave ······ *Zhang Cheng-lu* (787)

Research Notes

Instabilities Due to Runaway Electrons ······ *Xia Meng-fen, Zhou Ru-ling* (793)
The Elimination of Bright Continuous Spectral Background in Spectrogram by Means of Coherent Optical Processing ······ *Mu Guo-guang, Kang Hi, Li Zheng-ming* (798)
Electric Discharge Pumped XeBr Laser with High Power and High Efficiency ······ *Chen Jian-wen, Fu Shu-fen, Liu Miao-hong* (802)
The Dipolar Coupling and the Symmetry of Phonons in Molecular Crystals ······ *Wu Gao-zhen* (806)
Generalized Suzuki Formula and Its Application in Liquid Crystals ······ *Zhang Zhao-qing, Feng Ke-an, Lin Lei* (812)

No. 7

Modification of the Sensibility Equations of Various Infrared Systems ······ *Zhang You-wen* (823)
Measurement of the Emissivity and Radiation Temperature of Various Room Temperature Materials ······ *Zhang You-wen, Zhang Cai-gen* (835)

A Model of the Relative Displacement of the *d* Band in A-15 Superconducting Compounds ……… *Pan Shao-hua, Luo Qi-guang, Lin Fu-sen* (842)
An Approximate T_c Formula of Type A Superconductors (II) ……… *Wang Zhong-yan, Zhou Zi-fang, Mao De-qiang, Zhang Xi-mang, Wu Hang-sheng* (849)
Low Frequency Internal Friction in Aluminium-Copper Alloys in the Process of Plastic Deformation ……… *Zhang Jin-xin (Z. S. Chang), Ge Ting-sui (T. S. Kê)* (859)
Morphology of the Copper Precipitates in Silicon Single Crystals ……… *Bu Tu, He Yi-zhen* (856)
Infrared Absorption of Oxygen in Silicon and Germanium at Low Temperatures ——— *Xu Zhen-jia, Chen Yu-shang, Jiang De-sheng, Song Chun-yang, Li He-sheng, Song Xiang-fang, Ye Yi-yang* (877)
Transformation Properties of Three Sets of Closed Time Path Green's Functions ……… *Zhou Guang-zhao, Yu Lu, Hao Bai-lin* (888)
A Study on Growth Condition of FeOOH (I) ……… *Du You-wei, Lu Huai-xian, Zhang Yu-chang, Jiao Hong-zhen, Fan De-pei* (896)
The Theory of Resonantly Enhanced Four-Wave Mixing in Absorbing Media ……… *Fan Jun-ying, Wu Cun-kai, Wang Zhi-ying* (904)
Analytical Theory of Steady CO Laser ……… *Gao Zhi, Sun Wen-chao* (915)
Parametric Instabilities with Well Separated Frequencies in Magnetized Plasma ……… *Zhou Yu-mei, Cai Shi-dong* (926)
The Cerenkov Line Radiation and the Emission-Line Spectra of QSOs …… *You Jun-han, Cheng Fu-hua* (936)

Research Notes

Degenerate Four-Wave Mixing and Phase Conjugation in Organic Dye Solutions ……… *Wu Cun-kai, Cai Yong-zhao, Wang Zhi-ying* (939)
Ultrsonic Investigation of the Aqueous Solution of Polyacrylamide ……… *Feng Ruo* (944)
The Asymmetric Line Shaspes of the Mössbauer Spectra of α-FeOOH ……… *Du You-wei, Zhang Yu-chang, Lu Huai-xian, Jiao Hong-zhen* (949)
Dischage-Pumped Multiwavelength Laser ……… *Fu Shu-fen, Chen Jian-wen, Liu Miao-hong* (955)
Performance of Level Slicing Using Film Nonlinearity ……… *Zhang Hong-jun, Dai Jian-hua, Lu Nai-guang* (960)

No. 8

Nonequilibrium Statistical Field Theory and Critical Dynamics (I) ……… *Zhou Guang-zhao, Su Zhao-bin, Hao Bai-lin, Yu Lu* (968)
Nonequilibrium Statistical Field Theory and Critical Dynamics (II) ……… *Zhou Guang-zhao, Hao Bai-lin, Yu Lu* (977)
Energy Band Theory of Heterometal Superposed Film ……… *Zhang Li-yuan, Yin Dao-le* (986)
An Empirical Correlation Between Superconducting Transition Temperatures T_c and the Hall Coefficients in Amorphous Superconductors …… *Cao Xiao-wen, Li Yu-zhi, Xie Jian-sheng, Zhang Yu-heng* (991)
A. C. Conductance of Organic Solid Thin Films …… *Qian Ren-yuan, Jin Xiang-feng, Zhou Shu-qin* (999)
A General Transformation Formula for SHG Coefficients of a Crystal and Those of Its Anionic Groupings ……… *Chen Chuang-tian, Chen Xiao-shen* (1013)
Molecular Structure, Crystal Structure and Absolute Configuration of Tenaciss Igenin ……… *Tenaciss Igenin Structure Group, Institute of Biophysics, Academia Sinica* (1022)
A New Type of Continuous Solid Solutions——The Variation of Crystal Structure Types of $Mg_{x/2}Li_{1-x}IO_3$ with Composition ……… *Liang Jing-kui, Zhang Yu-ling, Liu Hong-bin* (1032)
The Geometry of Lattice Planes ……… *Yang Ji-heng, Ye Heng-qian* (1038)
Bands of Scattered Light Produced in an α-$LiIO_3$ Single Crystal Under the Action of a DC Electric Field ……… *Yang Hua-guang* (1047)
Calculations of the Equations of State for Some Simple Metals with Pseudopotential Method ……… *Li Shu-shan, Lin Guang-hai* (1057)

Research Notes

A New Method for Solving the Free-Boundarg Magnetic Surface Equation without Conducting Shells ……… *Shen Jie-wu, Zhou Yu-mei, Qing Cheng-rui* (1062)
High Pressure Equation of State and Phase Transformation of $LiIO_3$ ……… *Xu Ji-an, Wang Yan-yun, Xu Min-hua* (1067)

Investigation of the Solid Solutions in Alkali-Metal Iodate Pseudo-Binary Systems ······ *Tang Di-sheng, Che Guang-can, Tian Jing-hua* (1074)
Crystal Growth, Morphology and Optical Property of Complex Salt $KIO_3 \cdot 2LiIO_3$ ······ *Hu Bo-qing, Ma Wen-yi, Zhou Tang* (1079)
Criterion of Primitive Solutions in the Automatic Indexing of Electron Diffraction Patterns ······ *Guo Ke-xin, Liu Ping* (1083)
Quantum Mechanical Treatment of a Damped Harmonic Oscillator ······ *Peng Huan-wu* (1089)
Further Test for the "An Empirical Rule for Superconducting A-15 Type Compounds" ······ *Luo Qi-guang* (1092)

No. 9

Renormalized Quasi-linear Theory of Turbulence in Non-uniform Plasma (I) ······ *Qiu Xiao-ming (S. M. Chiu)* (1103)
Renormalized Quasi-linear Theory of Turbulence in Non-uniform Plasma (II) ······ *Qiu Xiao-ming (S. M. Chiu)* (1109)
The Calculation of Current of Maintaining Field in Toroidal Plasma Equilibrium ······ *Zhang Chun-yuan, Sun Ji-guang, Qing Cheng-rui* (1120)
Theory of Optimum Designing for the Systems of Pulse Strong Magnetic Field ······ *Zhang Yu-heng* (1134)
A Study of Thin Film Grating Coupler ······ *Xu De-wei* (1141)
Movement of Space Speckle ······ *Wu Xiao-ping, He Shi-ping, Li Zhi-chao* (1150)
The Total Yield and Energy Spectra of the Secondary Particles of Thermonuclear Reaction ······ *Xu Jin-kun* (1157)
Mechanism of Electrical Conduction of α-$LiIO_3$ Single Crystal and Its Electric Conductivity at Low Temperatures ······ *Zhang An-dung, Zhao Shi-fu, Xie An-yun, Xu Zheng-yi* (1163)
A Dislocation Source in the Float-Zone Grown Silicon Single Crystals ······ *Liu Zhen-mao, Wang Gui-hua* (1179)
Dislocation Internal Friction Peaks with Anormalous Amplitude Effect in Al-Mg Alloy ······ *Pan Zheng-liang, Wang Zhong-guang (C. K. Wang), Kong Qing-hu, Ge Ting-sui (T. S. Kê)* (1185)
The Problem of the Convergence Radius of the T_e Series Solution ······ *Zhou Zi-fang, Wu Hang-sheng, Mao De-qiang, Gu Yi-ming* (1192)
Random Systems with Inhomogeneous Concentration ······ *Zhang Zhao-qing* (1203)

Research Notes

Torsional Pendulum——A Possible Antenna for Detecting Low Frequency Gravitational Waves ······ *Zheng Qing-zhang, Cui Shi-zhi* (1207)
A Study of Sr Ferrite by Mössbauer Spectroscopy ······ *Zhang Yu-chang, Li Zheng-yu, Jiao Hong-zhen, Zhai Hong-ru* (1213)
Ellipsometric Study of Damage and Annealing in Arsenic Ion Implanted Silicon ······ *Mo Dang, Lu Yin-cheng, Li Dan-hui, Liu Shang-he, Lu Wu-xing* (1216)
Diffraction Geometry of Monochromatic X-Ray Quadruple Focusing Camera ······ *Guo Chang-lin* (1221)
A New Phenomenon about the {111} Planar Particles Blocking Dip in Single Crystal Si ······ *Wei Cheng-lian, Dong Yu-lan, Gao Zhi-wei* (1225)
A HVEM Observation of the Nb/Nb_3Sn Composite Superconducting Materials ······ *Wu Zi-qin, Guo Qiao-jun, Li Yong-hong, Tang Xian-de* (1231)
An Analytical Solution of Confocal Unstable Optical Resonator ······ *Liu Jian-hang* (1236)

No. 10

The Effect of Photo-Injected Carriers in Forward Biased Junctions of a Multijunction Device ······ *Tan Song-sheng, Chen Pei-yan* (1244)
The Electrostatic Potential of Slow Exciton in a Polar Crystal ······ *Ku Shu-wei* (1253)
Kinetic Equation in a Stochastic Magnetic Field ······ *Xia Meng-fen, Hu Hui-ling* (1262)
The Kink Instability of a Plasma with Fixed-Boundary by the Method of Initial-Boundary Values ······ *Ke Fu-jiu, Shen Jie-wu, Xu Min-nan* (127[illegible])
X-ray Structure Analysis of Amorphous Alloys FeCoSiB, FeSiB and FeB ······ *Jin Long-huan, Chang Long-chun* (128[illegible])

Mechanism of the Formation of the Defects During Heat Treatment in Single Silicon Crystal Grown by Floating Zone Method under Pure Hydrogen ······ Jiang Bai-lin, Sheng Shi-xiong, Xiao Zhi-gang, [illegible] ([illegible])
The Crystal Structure and Phase Transitions of $2LiIO_3 \cdot HIO_3$ ······ Liang Jing-[illegible] ([illegible])
A Scheme for Optical Realization of Walsh Transformation ······ Yang Guo-zhen, [illegible] ([illegible])
The Optical Realization of Walsh Transformation with Coherent System ······ Chen Yan-song, Wang Yu-tang, Li [illegible] ([illegible])
Glansdorff-Prigogine Criterion and Theorem of Minimum Entropy Production ······ Chen Shi-gang (1322)
Transport Process under Strong Magnetic Field and Two Stationary Solutions of the Liouville Equation ······ Chen Shi-gang (1332)

Research Notes

A Note on the Radius of Convergence of the Series for Superconducting Critical Temperature ······ Lei Xiao-lin (1337)
Note on the Problem of the Convergence of the First Order Approximate T_c Series Solution ······ Zhou Zi-fang, Mao De-qiang, Gu Yi-ming, Wu Hang-sheng (1341)
Application of the Anomalous Scattering Effect in treating the Problem of Double Images Resulting from Patterson Analysis ······ Fan Hai-fu, Zheng Qi-tai, Li Peng-fei (1346)
Elimination of the Four-Fold Ambiguities Due to the Arrangement of Heavy Atoms by Making Use of the Direct Method ······ Fan Hai-fu, Zheng Qi-tai (1350)
The High Pressure Device of Diamond Anvil and the Observation of Phase Transition of Iodine and Sulphur ······ Hu Jing-zhu, Tang Ru-ming, Xu Ji-an (1354)
Electronic States in Systems with Reconstructed Overlayers ······ Zheng Wei-mou (1356)

No. 11

The Effect of Stochastic Magnetic Field on the Eigen-modes of Drift Wave ······ Zhang Cheng-fu (1366)
Kink Instabilities of a Plasma Column with Elliptical Cross-section ······ Gu Yong-nian, Qiu Nai-xian (1377)
The Effects of Anomalous Dissipation on the Dissipative-Trapped-Particle Modes ······ Xia Meng-fen (1384)
Electrical Resistivity of Disordered Crystalline Alloys ······ Lei Xiao-lin (1394)
Electrical Resistivity of Substitutional Alloys ······ Lei Xiao-lin (1404)
Theoretical Analysis of Open Resonators in the Form of Waveguide with Slow-varied Cross Section ······ Li Qiang-fa (1415)
A Generallized Coefficient Formula of the Third Order Magnetic Deflection Aberration and It's Relations with the Raster Pattern Produced by the In-Line Gun ······ Ding Shou-qian (1426)
Landau-DeGennes Model of First Order Phase Transitions——Gaussian Approximation ······ Liu Lei, Wang Xin-yi (1436)
Anomalous Sound Attenuation Near the Nematic-Smectic a Phase Transition of a Liquid Crystal ······ Feng Ke-an (1444)
Analysis of the Bulk-absorbing Pyroelectric Detectors with Edge Electrodes ······ Xu Ping-mao (1451)
Theoretical Estimates of R, R_p and ΔR_p of the Ion Implantation in Amorphous Targets ······ Wang De-ning, Cheng Zhao-nian, Wang Wei-yuan (1461)
A Rotating Crystal Neutron Time-of-Flight Spectrometer for Condensed Matter Investigation ······ Li Zhu-qi, Ruan Jing-hui, Wu Shan-ling, Yang Tong-hua, He Min, Lu Ting, Cheng Zhi-xu, Chen Gui-ying, Ye Chun-tang (1470)

Research Notes

Low Temperature Plasma in a Magnetic Well ······ Li Jia-quan (1478)
Results of Using a Torque Pendulum to Observe the Lunar Eclipe ······ Zhang Ping hua, Wu Yong-sheng, Liu Yi-cheng, Qin Rong-xian, Wang Guo-rong (1482)
The Trajectory of the Extraordinary Ray as the Crystal Rotates ······ Zhang Zhi-xiang (1489)
X-Ray Powder Diffraction Study of Mixed Bismuth Oxide Ferroelectrics with Layer Type Structure $PbBi_4Ti_4O_{15}$ and $SrBi_4Ti_4O_{15}$ ······ Guo Chang-lin, Wu Yu-qin (1496)
Phase Diagram of the Pseudo-Binary System Li_4GeO_4-Zn_2GeO_4 ······ Tang Di-sheng, Che Guang-can, Chen Li-quan (1502)
A New Phase Magnesium Iodate $Mg(IO_3)_2 \cdot 2H_2O$ and Solubility-Temperature Diagram of $Mg(IO_3)_2$-H_2O System ······ Jia Shou-quan, Niu Hong-da, Jiang Pei-zhi, Fan Xian-he, Li De-zhen (1506)
The Diffusion and Distribution of Catalyst Metal Nickel in Polycrystal Diamond Grown under Ultra High Pressure ······ Cheng Yue-ying, Chen Jing-zhang, Chen Liang-chen (1512)

Measurements of First, Second and Fourth Sound-Velocity in Superfluid HeII .... *Zong Yon-tai, Qian You-neng, Zhou Hong-lai* (1516)

No. 12

Composite Lattice of Two phases with a Coincidence Site Lattice Relationship (I) ...... *Yang Qi-bing* (1525)
Composite Lattice of Two Phases with a Coincidence Site Lattice Relationship (II) ...... *Yang Qi-bing* (1534)
A Study of Internal Friction Associated with the Martensite Transformation at Low Frequency .... *Wang Ye-ning, Chou Yi-feng, Chang Zhi-fang* (1544)
A Phase Diagram of the Alloys of the Ternary System of the Aluminium-Copper-Gallium .... *Pan Yu-ying, Zheng Jian-xuan (C. S. Cheng)* (1550)
A New Graphic Method of Indexing Debye-Scherrer Photographs .... *Lu Xue-shan (S. S. Lu)* (1557)
Crystal Growth of $Y_{3-x}Bi_xFe_5O_{12}$ .... *Xu Xiao-zhen, Jia Wei-yi, Liu Chao-xin* (1563)
A Closed-Form Approximation for the 3-Dimensional Ising Model (II) .... *Shi He, Hao Bai-lin* (1569)
Scattering of Laser Beam by Diffusing Surfaces (II) .... *Cheng Lu, Zhang Bing-quan* (1580)
The Generation of Far-Infrared Radiation by Difference-Frequency Mixing of Surface Waves .... *Huo Chong-ru, Huang Xi-yi* (1587)
A New Principle for Laser Tuning——Tuning by Self-Injection .... *Xu Zu-yan, Pan Shao-hua, Deng Dao-qun, Guo Dong-sheng, Li Xiu-fang* (1595)
Chlorine Chemisorption on the Silicon and Germanium Surface .... *Zhang Kai-ming, Ye Ling* (1603)

Research Notes

The Harris Singularity of the Josephson Current of a Junction Driven into Non-Equilibrium .... *Mao De-qiang, Gu Yi-ming, Zhou Zi-fan, Wu Hang-sheng* (1607)
The Caculation of Intensity Distribution for the Interference Pattern of Diffused Light ...... *Zhan Da-san* (1612)
The Chemisorption of Al on the GaAs (110) Surface .... *Zhang Kai-ming, Ye Ling* (1616)
The Hawking Evaporation of Dirac Particles .... *Liu Liao, Xu Dian-yan* (1624)
Calculations of Hugoniot Curves for Five Simple Metals with Pseudopotential Method .... *Li Shu-shan, Lin Guang-hai* (1629)
The Study of SHG in the Polydomain Striae Region of $LiNbO_3$ Single Crystal .... *Wang Ye-ning, Chu Jing-sung, Tan Jun-peng* (1635)
Observation of Dislocations and Subboundaries in Optically Active Crystal $Bi_{12}GeO_{20}$ by Means of Reflection Birefringence Topography .... *Xu Xiu-ying, Feng Duan* (1639)
An X-Ray Method of Determining the Degree of Preferred Orientation of Ferroelectric Material with Layer Type Structure after Hot-Pressing .... *Kuo Chang-lin, Wu Yu-qin* (1644)
Influence of the Transmission Light of α-$LiIO_3$ Single Crystal by the Application of an Electrostatic Field .... *Wang Xiu, Luo Gui-yun* (1648)

Index to 'GAOFENZI TONGXUN'

Beijing GAOFENZI TONGXUN in English No 6, 1980 four pages preceding back cover

[Following is annual index of Chinese journal GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] for calender year 1980]

Papers

A General Method for Calculating the Mean Square Electric Dipole Moments and the Mean Square Lengths of Polymeric Chains .... *He Fucheng* (1-1)
The Primary Radical Termination in the Photopolymerization of Methyl Methacrylate .... *Yu Tongyin, Wang Lihui, Bu Haishan, Li Haisheng and Zhao Yanlai* (1-10)
Terpolymerization of Epichlorohydrin, Ethylene Oxide and Propylene Oxide .... *Xie Hongquan, Zhu Jiang and Liu Xiuxiang* (1-16)

Studies on the Lowering of the Spinning Temperature of Polypropylene by Adding of 4-Hydroxy Tetramethyl-piperidine-1-oxyl .... *Hou Xiaohuai, Fan Yuxiang and Shen Dekong* (1-22)

The Morphology and Extension Behaviour of cis-1,4-polybutadiene Rubber .... *Zhou Enle, Xu Bailing and Jia Lianda* (1-27)

Characterization of the Structural Features of the Poly-p-phenylene Terephthalamide (PPTA) Films by Light Scattering Method .... *Hu Shiru and Xiu Mao* (1-35)

Study on Birefringence of Biaxially Hot-stretched Acrylics by Using Convergent Polarized Light .... *Lü Xici and Luo Hezhang* (1-45)

Study of the Molecular Weight Distribution of the Epichlorohydrin Elastomer by Means of a Simple GPC Column .... *Li Miangui, Fu Gongcheng, Cao Haitian and Xie Hongguan* (2-65)

The Stereoregularity of Poly-2, 2, 3, 3-Tetrafluoropropyl Methacrylate .... *Tien Yulin, Zhou Gengyuan and Li Zexin* (2-73)

The Study on Poly(tetramethylene terephthate)-Poly (tetramethylene ether) Multiblock Copolymer .... *Wu Meiyan, Shi Manli, Cheng Youqing, Chen Chuanfu and Yu Shenkai* (2-77)

The Catalytic Systems for Polyether-Polyester Block Copolymerization .... *Wang Shenguo, Wang Yueding, Liu Ruiqiong and Xiao Enpei* (2-84)

The Structural Characteristics of a new Propylene Polymerization Catalyst .. *Xie Guanghua, He Dawei, Jiang Man, Hu Youliang and Shen Huimiao* (2-89)

Vulcanization Characteristics of Bie Obtained with Rare-Earth Catalysts .... *Fang Tianru, Yu Yali and Gao Shuzhen* (2-94)

Studies on the Properties of Polyelectrolyte Solutions I. Viscometric Behavior of Polyelectrolyte Solutions in the Absence of Added Salts .... *Liu Maotao, Wang Suchen, Xin Yonghe and Qian Jinwen* (2-99)

Studies on the Properties of Polyelectrolyte Solutions II. Viscometric Behavior of Polyelectrolyte Solutions in the Presence of Added Salts .... *Liu Maotao, Wang Suchen, Xin Yonghe and Qian Jinwen* (2-106)

The Dependance of Calibration Coefficient K of VPO Measurement on the Molecular Weight of Solute ...... *Gao Yushu, Liu Yong and Liu Yaoping* (2-112)

Polymerization and Copolymerization of 3-Nitropropene 1,2-Epoxide in the Presence of Boron Trifluoride Etherate .... *Xu Yuwu, Deng Kezi, Wang Hongzuo, Wang Wenxue, Zhou Manli and Yang Dequan* (2-118)

The Computational Multipeak Resolution Method for the X-Ray Diffraction of Polypropylene Fibres .... *Li Pantong, Qi Shaoqi, Wu Wenbin and Chang Jianpeng* (3-129)

NWG——A Porous Silica Microsphere Packing for High-Performance GPC .... *Chai Zhikuan, Sun Yueming and Pang Zhilong* (3-134)

Relationships between Fracture Toughness, Morphology of Fracture Surface and Compositions of Polymethylmethacrylate .... *Lü Xici and Chang Son* (3-139)

Preparation and Properties of Polyphenylquinoxaline .... *Lu Fengcai, Xu Xiumei, Wang Baigeng, Chang Jinbiao, Xing Lanmin, Wang Yulan, Gao Yuanming and Bai Luna* (3-146)

Bicyclo [2. 2. 1] Hept-5-ene-2,3-Dicarboxylic Anhydride Capped Polyimide and Its Composites .... *Wang Dong, Wu Yaoman, Li Jiaze, Zhang Chongli, Yu Shangying, Jin Jianrong and Huang Zhitang* (3-152)

The Deformation of Polyethylene Spherulites during Uniaxial Drawing (III) .. .. *Li Lisheng, Zhang Guangli and Li Enwen* (3-159)

Studies on the Syntheses and Electric Properties of Conjugated Macromolecules of Polyschiff's Base .... *Li Zhifen, Zhang Shufan, Liu Tongming and Pan Xizhe* (3-162)

The Determination of Residual Monomers in Poly-N-Vinylcarbazole by GPC .... *Ye Meiling, Wang Jianfang and Shi Lianghe* (3-168)

Synthesis and Polymerization of γ-Alkoxy-β-Hydroxypropyl Acrylates .... *Lu Chengxun, Cheng Naichun, Gu Zhongwei and Feng Xinde* (3-173)

Synthesis of Polyphenyl-as-triazine from 1, 4-dicyanobenzene .... *Lu Fengcai, Xing Lanmin, Wang Yulan and Liu Yu* (4-193)

On the Bicyclo[2.2.1]hept-5-ene-2, 3-dicarboximide .... *Zhang Chongli and Huang Zhitang* (4-198)

Emulsion Copolymerization of Isobutyl Methacrylate with β-Hydroxyalkyl Methacrylate and Its Uses as the Barrier Film Material in the Aluminized Screen Technique .... *Li Fumion, Sun Yanhui, Sun Shihai and Yuanan* (4-203)

The Study of the Structure of Polyethylene Terephthalate by Means of Fourier Transform Infrared Spectroscopy .... *Shen Deyan, Yang Xiaozhen, Zhu Shannong, Wu Qihui and Wen Zaiqing* (4-209)

Study of Kinetics of Polymerization of Propylene by Solvay Catalyst .... *Zhang Cuiju and Yu Xun* (4-214)

On the Peak Spreading Correction in GPC I. The Properties of Tung's Equation and the Method of Finding the Stable Solution in Numerical Calculation .... *Chen Yihong* (4-219)

Highly Effective Activators-polyhalophenols in the Ring-opening Polymerization of Cyclopentene .... *Chen Wenqi, Pang*

Study on the Sequence Structure of Methyl Methacrylate-Styrene (M-S) Copoly-

Deren, Zhang Yuming, Zheng Yulian, Yang Caiyun and Shen Zhiquan (4-226)

A Study on the Expression Function of Peak Profile and the Resolution of Spectral Overlapping Peaks .... *Feng Yunhe, Liang Xuehai, Lin Ruixun and Wu Shuanchi* (4-231)

Equilibrium in Zinc Di-n-butylphosphinate Polymer and Water System .... *Liu Hanfan, Li Zhenyi, Guo Chuanjie and Liu Shufen* (4-236)

Synthesis of N-p-acryloxybenzoyloxy Succinimides and the Use of Its Copolymer for Immobilization of Serum Protein .... *Lu Chengxun, Gu Zhongwei, Feng Xinde Wang Chongqing and Li Dechang* (4-240)

Crosslinked Polystyrene Gels of Low Permeation Limit for Gel Permeation Chromatography .... *Shi Lianghe, Chai Zhikuan, Zhang Xianwang, Fu Xiucheng, Wen Zaiqing, Chen Guoqing, Liu Shuquan and Yao Liuhong* (5-257)

On the Peak Spreading Correction in GPC II. An Effective Method of Iteration for Solving Tung's Equation .... *Chen Yihong* (5-263)

The Molecular Weight Distribution Functions of the Polymers Generated in Anionic Polymerization Initiated By Electron Transfer ...... *Yan Deyue* (5-271)

The Selection of Solvents for Polymers——Characterization of the Solvency of Solvents for Polymers by Thin Layer Chromatography ...... *Xu Chengwei and Song Xubing* (5-281)

The Supermolecular Structure of FEP Copolymer and Its Influence on the Cracking Behavior ...... *Zhou Xingmao, Jia Lianda, Liu Li, Wang Guoying and Zhou Enle* (5-285)

Kinetics of butadiene polymerization in the presence of Ln(naph)$_3$-Al(i-C$_4$H$_9$)$_3$-Al(i-C$_4$H$_9$)$_2$ Cl catalyst system.. *Yu Guangqian and Hu Zhenya* (6-321)

The friedel craft reactions of the chloromethylated styrene divinylbenzene copolymers ...... *He Binglin, Zhang Quanxing, Li Xiaobai, Chen Changzhi, Shi Rongfu and Wang Jianying* (6-328)

The Flaw and Stress-Cracking Performance of FEP Copolymers ...... *Yu Wenhui and Jiang Bingzheng* (6-335)

A phenolic resin with higher carbon content and lower modulus ...... *Yu Shangying, Shi Meiyuan, Wu Yaoman and Huang Zhitang* (6-341)

Studies on the adsorption problems of porous silica gels for GPC ...... *Yang Yajun, Bei Jianzong and Zhang Xinghua* (6-346)

Studies on the polyamide——poly(1,4-phenyleneterephthalamide) ...... *Bao Jingsheng, You Anji, Zhang Shufan, Zhang Shengqing, Hu Chang, Li Xuefen and Xi Fu* (6-352)

Oxidation and polymerization of acrylic esters in the presence of amine ...... *Cao Weixiao and Feng Xinde* (6-357)

Oxidation and polymerization of acrylic esters in the presence of phenyl hydrazine ...... *Cao Weixiao and Feng Xinde* (6-362)

Synthesis of polyester-polyether segmented copolymers from polyether with acetoxyl end groups ...... *Wu Maiyan, Shi Manli, Xu Fei and Mao Yadi* (6-367)

The DSC studies of polyethylene terephthalate ...... *Guan Jiayu, Xu Mao, Mei Jibang and Guo Meihua* (6-372)

Notes and Short Communications

Determination of the Molecular Weight Distribution of Poly (Ethylene Terephthalate) by GPC ...... *Jiang Erfang* (1-51)

mers by Infrared Spectroscopy ...... *Chang Xianwang, Chu Shannung, Jin Shunzi and Liu Lanchen* (2-123)

The Group Additivity Method for the Estimation of Heat and Entropy of Polymerization ...... *Luo Yuran* (3-178)

Inhibiting Properties of 2,2,6,6-Tetramethyl-4-Oxo-Piperidine-1-Oxyl and Its Synergistic Action with Quinones ...... *Zhang Ziyi and Liu Zhaorong* (3-182)

Investigation of Texture-Structure and the Defect of Acrylic Fiber by Sem ...... *Zeng Hanmin and Xia Feng* (3-186)

RTV Silicone Adhesive ...... *Li Dingcai, Sun Hong and Wu Guanli* (3-190)

Theory of Gelation of Polyurethanes ...... *Yang Kexi* (4-247)

Studies on the Ring-opening Polymerization of Tetrahydrofuran II. Allyl Bromide and Silver Perchlorate as Initiator System ...... *Zhang Hongzhi, Li Bingming and Feng Xinde* (4-251)

Synthesis of Strong Basic Type Anion-exchange Resin Via Sulphuryl Chloride-methylat Method ....
Chen Yiyong, Xu Chengwei, Liu Tongbao, Zhu Yongqun and Song Xubing (4-254)
New Expressions to Describe the X-ray Scatter by the Amorphous Component in Polymers ..... *Wu Wenbin, Qi Shaoqi, Feng Rongyin and Li Pantong* (5-292)
Synthesis and Characterization of Polysulfone-nylon 6 Block Copolymers .... *Ding Youjun and Tian Xishang* (5-297)
A Simple Differential Scanning Calorimeter(DSC) .... *Teng Jinkui, Shen Quanao, Fang Aimei, Huang Wei, Xu Maohua, Qi Yuchen, Song Yongxian and Chen Donglin* (5-301)
The Crystallization and Orientation of Natural Rubber under Uniaxial Drawing .... *Li Lisheng, Zhang Guangli and Liu Yihua* (5-306)
Microanalysis of Fluorine in Fluoropolymers .... *Wang Changyi and He Haiching* (5-309)
The Influence of Sodium Thiocyanate on Peroxide Initiated Aqueous Polymerization of Acrylonitrile ....
Qiu Kunyuan, Wu Changshu, Zhuang Chuhui, Dai Ling and Feng Xinde (5-313)
A Study on the Sequence Distribution of Hexafluoropropylene in FEP Copolymers .... *Mo Zhishen, Yu Wenkui, Liu Li and Han Ping* (5-317)
A UV spectroscopic method for detecting traces of carbonyl group in PE films —— formation of phenylhydrazone formed on the films and the effect of various factors .... *Chen Zhonghan, Song Yuchun, Han Buyeng, Jiang Chengde, Zhang Xiuhua and Liu Fuju* (6-378)
A new equation for polymer solution viscosity concentration relationship .... *Chen Shouzkong* (6-382)

Corrigendam

A Discussion: "A New One-Point Method Equation Determining Intrinsic Viscosity" .... *Liu Foyun* (2-127)

Review Article

Study of Polymers by Inverse Gas Chromatography .... *He Manjum and Zhang Zhongquan* (1-55)

Index to 'DIWEN WULI'

Beijing DIWEN WULI in English Vol 2, No 4, 1980 pp iii-iv

[Following is index to DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] for calendar year 1980]

No. 1

The Static Behaviours of the Variable Thickness Superconducting Microbridges .... *Yoa Xi-xuan* (8)
The Superconducting Pinning Mechanism in Bcc Niobium-base Alloys .... *Hu Su-hui* (15)
The Effect of Non-ideal Surface on Phonon State Density——an One-Dimensional Chain Model and the Method of Green's Function .... *Shi Zhi-zhong, Tao Rui-bao* (21)
The Induced Method to Measure the Critical Currents of superconductors .... *Wang En-yao, Zheng Zhi-qin, Zhu Xue-wu* (26)

The Research on the determining T_c of the prac-tical superconductors with an Inductance Method ……
…………………………………… *Wang Shou-zheng* (33)
A Method for the Research on the Superconductivity Magnetization Curve ………… *Shao Hui-min* (38)
Some Results of the Permanent Contact Josephson Junction ………… *Sheng Yu-bao, Yang Sen-zu* (42)
The Behavior of Superconducting Magnets with Different Structure ……………………
……… *Wang Jin-xing, Han Pen-lin, Sun Kun-she, Tang Kai-rong, Li Huan-xing, Wang Kui-wu* (48)
The Effect of Superconducting Magnet Technology on its energized Characteristic ………………
……… *Han Han-min, Chen Zhuo-min, Shi Ai-yu, Wang Fu-tang, Ding Li-ren, Jiao Zheng-kuan* (55)
The Calculating Method for the Designing of the Oil Constant Pressure Indicator ………………
…………………………… *Zhang Yu-heng, Li Yu-zhi, Cao Xiao-wen* (61)
Acquirement of 40K by Mean of Liquid Nitrogen ……………………………… *Chang Kai-da* (64)
Heat Leaks and Temperature Profiles of a Wide-nicked Glass Experimental Dewar ………………
…………………………… *Yan Shou-sheng, Lu Guo, Xiong Guang-cheng* (71)
Temperature Fluctuation in Cryostat ……………………………………… *Zhou Hong-lai* (76)
Fabrication of Hollow Superconducting NbTi Composites ……………………… *Zhao Xuan-lan* (78)
Some New Types of Superconducting Materials ……………………………………………
………………… *Second Laboratory, Institute of Non-ferrous Metals in Shanghai* (80)

No. 2

Electron States at Superconducting-Normal Interfaces …… *Yang Zhan-ru, Gong Chang-de, Cai Jian-hua* (92)
Superconductivity of Lanthanum ………………………… *Zhang Li-yuan, Yin Dao-le, Han Ru-shan* (97)
Enhancement of the upper Critical Field of Two-Band Superconductors ……………… *Lei Xiao-lin* (110)
Experimental Investigation of the Determination of the Charicteristics of the Short Samples of High Current Superconductor with Inductive Methods ……………………………………
……………… *Yi Chang-lian, Kong Qing-wen, Zhou Huei-juan, Ma Hong-da, Yan Lu-guang* (118)
Analysis of 2-Dimensional Magnetic Field Homogeneity for Superconducting Dipoles and Rational Selection of Geometrical Parameters of the Windings ………………………… *Feng Zhi-xing* (127)
Estimation of Radial Temperature NoN-Uniformity (Gradient) Effects on Precision Cryogenic Thermometer Calibrations ……………………………………………………… *Deng Da-ren* (134)
Calculation of the Shuttle Heat Transfer in A Reciprocating Refrigerafor ………… *Yang Chun-jiang* (141)
Development of A NbTi-CuNi-Cu Multifilamentary Superconducting Composite and flat Cable ………
…………………………… *Xie Hui-jin, Zhou Gui-xing, Guo Zhen-jin, Chen Zhen-zuo* (1[illegible])
An Experimental Study of Dynamical Process of Quenching of Superconducting Magnet ………………
……………… *Chen Zhuo-min, Han Han-min, Shi Ai-ru, Wang Fu-tang, Jiao Zheng-kuan* (158)
The Study of New Melting Technology of NbTi50 Superconducting Alloy ……………………………
…………………………… *Zhou Nong, Li Cheng-ren, Wu Xiao-zu, Xiong Shou-gao* (163)
Measurement of the J_C–H Curves of Three Kinds of NbTi Wire under Different Temperatures ………
…………………………… *Cheng Ben-pei, Wang Jin-xing, Tang Kai-rong, He Yi-gui* (170)
Observation on Two Kinds of Structures in the Vapor-Deposited Nb_3Sn Tape ……… *Wang Shou-zheng* (174)

No. 3

Surface States of a Superconductor ……… *Gong Chang-de, Yao Xi-xian, Cai Jian-hua, Yang Zhan-ru* (182)
A Simple Electron Tunneling Spectroscopy and Observation of Phonon Structures in the Superconducting Tunneling Junctions ……………… *Li Hung-cheng, Gao Jie, Wang Ping-shu, Zheng Guo-guang* (187)
Some Structure Factors Determening the Critical Temperature of Superconductors ……………………
…………………………………………………… *Yang Pin, Luo Zun-du* (192)
Phase Analysis of the Inclusions in Nb–Ti Superconducting Composites ……………………………
…………………………………… *Mao Shi-miao, Chen Suo-guan, Lu Yi-ning* (198)
Charge Transfer model for the Superconducting compounds with B-1 Structure ……………………
…………………………………………… *Liu Zhen-xing, Zhao Zhong-xian* (204)
The Measurement and Analysis of Specific Heat of Solids at Low Temperatures ……………………
Zhu Xian, Ji Yong-fu, Dang Zheng, Hou Jun, Bai Ping-mian, Han Yuan-zhou, Sun Chong-chi (213)
The Design and the Tests of the SCR Switch for Protecting S. C. Generators at Quenching ………
…………………………………………………… *Shen Ji-ren, Chen Da-yong* (219)

The Effect of Heat Treatment on Multifilamentary Nb$_3$Sn Superconductors Prepared by Bronze Method
…… *Tang Xian-de, Shan De-qin, Li Ming-sheng, Zhu Ding-si* (229)
The Research of Cu–Ti Diffusion Layer in Composite Superconductor NbTi50/Cu ……
…… *Guo Ji-yan, Xiong Shou-gao, Ma Wen-Ming* (240)
A Partial Voltage Method …… *Jia Yun-fa, Li Bao-zeng* (245)
A Flexible Linear Scanning Circuit …… *Zeng Pei-wei, Xu Feng-zhi* (248)
The Manufacture of Liquid Helium Experimental Metal Dewars Using Multilayer Insulation System
…… *Ran Qi-ze, Jin Duo, Chen Pu-fen* (254)
Low Temperature Magnetoresistance of the RS–11 Carbon Resistors …… *Chen Pu-fen* (260)
Superconductivity in Ti–Pd System ……
Jin Zuo-wen, Ran Qi-ze, Liu Zhi-yi, Jin Duo, Zhao Zhong-xian, Ma Ming-Rong, Luo Qi-guang (262)

No. 4

Hydrodynamic Equation of the Solution of Superfluid ^{3}He–^{4}He Mixture(I)…… *Gu Guo-qing, Zhu Yun* (267)
A Getter Sputtering Apparatus ……
…… *Meng Ru-ling, Chen Gui-yu, Zhao Bo-ru, Guo Shu-quan, Li Lin, Chen Lan-feng* (272)
The Designing Calculation of high homogeneous NMR Superconducting magnts …… *Zhao Yu-ying* (279)
The Effects of Stress of the Superconducting Materials ……
…… *Jiao Zheng-kuan, Chen Zhuo-min, Zhang Qi-rui, Jia Yun-fa* (293)
An Improvement on transfer tube for Liquid helium …… *Qian Din-rong, Xie Yun-bao* (296)
Experimental Investigations of Nb-Ti Superconducting Magnets …… *Cao Xiao-wen* (304)
11T High Field Superconducting Magnet ……
…… *Yu Kun, Han Cui-ying, Cui Chang-geng* (310)
Measurement of Magnetization Curve for Superconductive Nb$_3$Sn ribbon in perpendicular Field ……
…… *Yin Bou, Liu Gui-rong, Cui Chang-geng* (316)
An Automatic Control Cryostat for Low Temperature Impact test ……
…… *Zhang Chun-tang, Liu Shang-yun, Song Shu-guan, Hu Xi-xing, Li Zhi-guang* (322)
The Effect of the quality of direct Current Source on the Closed Capacity of the Superconducting Switch
…… *Lin Yu-bao, Wang Shu-yuan, Zhang Yong* (330)
Measurement of Magnetizations of Several Stainless Steels at 4.2K …… *Meng Qing-hui, Han Shi-ji* (336)
Investigation on the " in Situ" Multifilamentary Cu-Nb$_3$Sn Superconductors ……
…… *Shanghai Institute of Metallurgy, Academia Sinica, Department of Physics, Beijing University* (340)
Effects of Mechanical Stress on Critical Current of Nb—Ti Superconductors ……
…… *Zhu Xue-wu, Wang En-yao, Zheng Zhi-qin, Wang Qian* (343)
A Low Temperature Control electric bridge of high precision …… *Zhang Dian-lin* (346)

CSO: 4008

PUBLICATIONS

TABLE OF CONTENTS OF 'GONGCHENG JIXIE,' JAN, FEB, MAY, JUN 1980

Issue No 1

Beijing GONGCHENG JIXIE [ENGINEERING MACHINERY] in Chinese Jan 80 inside front cover

[Text] Product and Structure

Model LT-6 Asphalt Concrete Spreader
Xian Road Construction Machinery Plant, Science Institute, Ministry of Communications.. (1)

Introduction to Concrete Surface Paver
Wang Manxia [3768 3341 7209] and Liao Qingjiong [1675 1987 3518]........... (7)

Loader Converted from D80-7 Tractor
Yan Xuelan [7346 1331 5695], Engineering Machinery Plant, Fourth Engineering Bureau, Ministry of Railways.. (8)

Design and Calculation

An Investigation of the Indirect Measurement of Main Speed Reducer Gear Load Spectrum and Calculation of Fatigue Strength
Si Zhihai [0674 1807 3189].. (9)

Preliminary Selection of Forward Shovel Bucket Shaft Mechanism in Hydraulic Excavator
Yu Tongsi [0151 0681 1585].. (15)

Assembly Condition Calculation for Nonuniform Distribution of Planetary Wheel in 2K-H Planetary Transmission

Yang Xinping [2799 9515 1627], Construction Machinery Institute, State Construction Commission.. (18)

Investigation and Testing

Radio Remote Sensing of Engineering Machinery Speed Characteristics
Ouyang Mei [2962 7122 5019] and Zhang Sili [1728 0643 0330], Jiangxi Construction Machinery Plant.. (21)

MSZ-1 Digital Flow Meter
Hu Pengcheng [5170 7720 4453], Tianjin Engineering Machinery Institute..... (24)

Experimental Study of Resistive Pressure Transducer
Zhou Langsheng [0719 7895 3932], Xuzhou Coal Mine Machinery Plant.......... (26)

Materials

Experimental Manufacturing of Excavator Bucket Teeth Using High Strength White Cast Iron
Jiang Zhenxiong [1203 2182 7160], Zhejiang University...................... (32)

Experimental Manufacturing of Excavator $1m^3$ Bucket Teeth Using ZG38Mn2MoSiV
Wan Yi [8001 3015], Jiangxi Foundry... (36)

Technical Innovations

Error in Machining Large Splines Hole and Correction of Cutting Tool Profile
Guo Yanchong [6753 1750 0394], Hangzhou Heavy Machinery Plant.............. (39)

JSBKL-C620, a Simple Digitally Controlled Lathe
Numerical Control Development Group, Puyuan Engineering Machinery Plant.... (41)

Combination Cutting Tool for Connector Center
Gao Jianhua (7559 1696 5478], Zhengzhou Engineering Machinery Plant........ (42)

Home-Built External Cylindrical Grinder for Cylinder Rod
Li Minwei [2621 3046 0251], Hubei Construction Machinery Plant............. (43)

Medium-frequency Quench Hardening of Rolling Channel Surface
Zhang Hongqui [1728 4767 6311], Tianjin Engineering Machinery Plant........ (45)

Medium-frequency Quenching Machine for Revolving Support of Automobile Hydraulic Hoist
Xu Jingming [6079 4842 2494].. (14)

Usage and Maintenance

Basics of the Diesel Engine Cylinder Casing and Cylinder Body Pitting Problem
Xie Tianren [6200 1131 0088], Heilongjiang Dailing Agriculture Cadre School (47)

Bench Tests and Application of Floating O-ring

O-ring Group, Tieling Regional Institute of Chemical Engineering and Rubber (55)

Electrically Heated Rivet Furnace
Peng Manru [1756 2581 1172], Jiangxi Provincial Mechanical Engineering Company.. (31)

Special Topics Review

Fundamentals of Excavator-Loader
Fan Jie [5400 2638].. (59)

Issue No 2

Beijing GONGCHENG JIXIE [ENGINEERING MACHINERY] in Chinese Feb 80 p 1

[Text] Design and Calculation

Traction and Driving Characteristics Analysis of Multipurpose Wheeled Engineering Machinery
Huo Enjun [7202 1869 0193].................................... (2)

Mechanism of Bucket Wheel Excavator With Impact Teeth
Zhao Xinghan [6392 5281 3352]................................... (9)

Technology and Facility

Application of Flame Surface Quenching in Large Crossed-Roller Rolling Disk
Wu Renjie [0702 0088 2638] and Zhang Yongkang [1728 3057 1660], Jiangsu Provincial Construction Machinery Plant.............................. (11)

Four-Axle Caterpillar Tread Tightener
Technical Group, Assembly Shop, Xuanhua Engineering Machinery Plant........ (13)

Five-ton Electric Flat Bed Trailer
Chen Baoxi [7115 0202 6007]................................... (16)

Ways To Improve Service Life and Reliability of Excavator Traveling Chain Wheels
Li Yingkai [2621 2503 0418] and Jiang Suining [1203 4840 1380] Fushun Excavator Plant.. (17)

Design of Cutting Tool for Gears With 25° Tooth Form Angle
Zhang Hanping [1728 3352 1627]................................. (20)

Machining Holes in Tractor Rear Axle Box With Hard Alloy Boring Cutter
Li Demian [2698 1795 4875]................................... (22)

Materials

Material Selection and Fabrication of Friction Plates
Yuan Fenggang [5902 7364 1481]................................. (24)

Standardization

Introduction to the SI System
Ding Yulan [0002 3768 5695]................................... (29)

Hydraulics

Control of Multiway Reversing Valve
Sun Shuhong [1327 2579 3414].................................. (34)

Braking Problem of Axial Plunger-type Hydraulic Motor in Certain Hoisting Machines
Yang Guochang [2799 0948 2490].. (40)

Investigation and Testing

Mathematical Equations for Checking the Performance Curves of YGE 70 Rock Drilling Machine
Shu Yitien [5289 5030 3944].. (44)

CJ-1 Digital Hole Goniometer
Platform Car Automation Section, Changsha Mining Institute................ (47)

A Simple Method for Measuring Torsional Moment
Cao Xiyao [2580 1585 5069].. (50)

Usage and Maintenance

Operation and Adjustment of Bulldozer in Terms of the External Characteristics of Diesel Engine
Yan Xinben [0917 0207 2609].. (54)

How To Prevent the Diesel Engine in Model D80A-12 Bulldozer From Burning its Bearings
Li Guangpei [2621 0342 0160].. (56)

Seal Cylinder Block Cracks With Epoxy Resin
Jin Baoling [7246 0202 1545].. (58)

Unloading Back-Hoe in Viscous, Wet Soil
Li Ji [2621 1323].. (59)

Field of Competition

An Investigation of the Transmission System of Electrically Powered Dual Caterpillar Tracks on Bucket Wheel Excavator
Xie Guoan [6200 0948 1344].. (60)

Trimmed-body Bucket Teeth
Liu Shengguang [0491 5116 0342].. (62)

Issue No 5

Beijing GONGCHENG JIXIE [ENGINEERING MACHINERY] in Chinese May 80 inside front cover

[Text] Investigation and Testing

Experimental Study of HB 15 Concrete Delivery Pump
Yong Tong [2799 6639] and Zhang Baoshu [1728 1405 2579], Construction Machinery Institute, State Construction Commission.. (1)

Analysis of the Thermal Properties of Disk Brake
Zhang Zhitie [1728 2535 6993], Central-South College of Mining and Metallurgy (7)

Products and Structure

Electrical Transmission System of Caterpillar Crane
Electrical Group, Design Section, Fushun Excavator Plant.................. (11)

Rolling-press Slot-fit Type Shaping Machine for High Strength Steel Reinforced Skeleton Structure
Sun Mingchang [1345 2494 2490], Beijing Municipal Engineering Institute.... (14)

0.3 m^3 Hinged Loader
Machinery Repair Plant, Guangzhou Highway Company......................... (16)

Introducing an AC Governing Device--Model VZ Eddying Braking Mechanism
Technical Section, Second Chemical Engineering Machinery Plant, Ningbo, Zhejiang.. (17)

Design and Calculation

Proper Layout of Tire Crane Struts With "Resultant Force Circle"
Ye Yuanhua [0673 0337 5478], Tongji University............................ (19)

Internal Force Analysis and Calculation for Variable Amplitude Arm Extension of Small Vehicle
Ge Xingquan [5514 2622 3123], Nanjing Municipal Construction Engineering Bureau.. (24)

Hydraulics

Developments of Medium and High Pressure Hydraulic Cylinders
Liu Zhiyuan [0491 1807 6678] and Chen Benzhu [7115 2609 2691]............. (34)

Solving W1002 Excavator Motor's Overload Problem With Hydraulic Torque Converter
Yang Manlin [2799 3341 2651], Fushun Excavator Plant...................... (39)

Field of Competition

Mobile Concrete Mixing Stations Should Be Developed
Ding Linrong [0002 2651 2837] et al....................................... (47)

Modify Old Products To Serve the Four Modernization Programs
Zhan Houzhi [6124 0624 0037], Shanxi Provincial Engineering Company........ (49)

Technology and Facility

Precision Casting and Machining of Large Modulus Gears
Wei Jianping [7614 7003 1627], Technical Section, Hefei Mining Machinery Plant... (53)

A Method That Prevents Parts From Becoming Deformed in Heat Treatment
Guo Zhongting [6753 1813 1694], Zhangchun Engineering Machinery Plant...... (57)

The Importance of Quality Annealing as Viewed From the Broken Axle
Physics-Chemistry Laboratory, Shanghai Construction Machinery Plant........ (58)

How To Improve the Quality of 110x1600 Long Cylinder
Chen Desheng [7115 1795 5168], Puyuan Engineering Machinery Plant.......... (59)

Simple Cylinder Grinder
Meng Shigong [1322 0013 1872], Sichuan Liangshan Zhou Transportation Vehicle Plant.. (60)

Usage and Maintenance

Introducing a Technique for Prolonging the Service Life of Friction Block
Qiu Ruiying [5941 3843 5391] Zhangfeng Branch, Fifth Bureau, Ministry of Water Conservancy.. (61)

Repair of Cast Iron Chain Wheel
Zhang Fa [1728 4099].. (62)

Cohesive Soil Removing Vibrator for Dump Truck
Liu Huanyuan [0491 3562 0337] First Engineering Team, Second Office, Third Railways Bureau.. (63)

Small Pipe Bending Machine
Technology Section, Jiangxi Yichun Engineering Machinery Plant............. (64)

Issue No 6

Beijing GONGCHENG JIXIE [ENGINEERING MACHINERY] in Chinese Jun 80 p 64

[Text] Product and Structure

Model JQ 500 Forced Concrete Agitator
Sheng Chunfang [4141 2504 5364] and Liu Weiceng [0491 4850 2582]............ (1)

Some Newly Developed Auxiliary Machinery Products for Reinforced Concrete
Cai Xinhuan [5591 1800 2970], Shi Ruiting [0670 3843 1656], and Yang Weirong [2799 4850 2837].. (4)

Improved Design of the Electrical Circuit System in Red Flag 100 Tractor
Zhang Bingwen [1728 4426 2429].. (7)

Design and Calculation

Calculation of Electric Motor Capacity Under Periodic Fluctuating Load During Long Operations
Lu Chinshan [0712 6855 1472].. (10)

Inner Gear
Chen Shouli [7115 1343 4409]... (12)

Investigation and Testing

Some Considerations in the Integral Testing of Truck Crane
Sun Qingrui [1327 1987 3843]... (19)

Measurements of Start-up Time and Braking Time of Revolving Mechanism in W-4 Crane
Yue Caixiang [1471 1752 5046].. (23)

Hydraulics

Cylinder Pressure Changing Process and Its Effects on the Performance of Axial Plunger Pump
Wen Baixing [2429 4102 5887]... (25)

What Is the No-Load Coefficient S_k of Hydraulic Torque Converter?
Yao Qixiang [1202 3825 5046]... (36)

Technology and Facility

Design, Manufacture, Inspection and Other Associated Problems of Planetary Gear Frame
Cai Hanmin [5591 3352 3046].. (37)

Technique of Chrome-plating Oil Cylinder Piston Rods According to Specification
Li Shudong [2621 6615 2639].. (40)

Modifying the M30 Tapping Drill
Su Demian [4725 1795 4875]... (42)

Sealing Well-type Gas Carburizing Furnace Cavity
Kang Baojie [1660 0202 2638] and Liu Zhida [0491 1807 6671]................ (43)

Far-infrared Oil Sand Core Drying Furnace
Lin Qianzheng [2651 6197 2973]... (44)

High Strength Thread Cutting Tool on Lathe Tailstock
He Guolian [0149 0948 4886] and Gao Jianhua [7559 1696 5478]............... (45

Usage and Maintenance

Repairing Easily Damaged Machinery Parts With Plasma Spray
Xu Zhong [1776 5883]... (46)

Modification of the Starter System in 4146 Diesel Engine
Zhang Chongren [4545 1504 0117].. (50)

Change Oil in Weight Supporting Wheel and Leading Wheel
Liu Liangkai [0491 5328 0418].. (52)

Simple Elevator on Tower Crane
Zhou Qiang [0791 1730]... (52)

Modification of the Band Brake Control Mechanism in Excavator Main Hoist
Wang Shubiao [3768 2885 2871].. (54)

45 Ton-meter [Low] Lift Tower Crane
Gu Zhanglin [6253 7022 2651] and Yin Guangtao [1438 0342 3447]............ (54)

Adjust Valve Clearance Using the "Cam Working Sequence Diagram"
Zhao Yuxin [6392 3768 0207].. (55)

Special Topics Review

Choice and Usage of Machinery Tires
Zhong Yanxun [6945 1693 1088].. (58)

9698
CSO: 4008

TABLE OF CONTENTS OF 'WUHAN DAXUE XUEBAO, ZIRAN KEXUE BAN' NO 2, 1980

Wuhan WUHAN DAXUE XUEBAO [WUHAN UNIVERSITY JOURNAL], ZIRAN KEXUE BAN [NATURAL SCIENCE EDITION] in Chinese No 2, 1980

[Text] A Limiting Case of the Imbedding Theorems of Sobolev's Spaces......Zhou Yulin [0719 3022 7792] and Sun Hesheng [1327 0735 3932] (1)

The Computation of the Coupling Stress for Structures with Multi-branches......Ye Biquan [5509 4310 3123], Shen Chengwu [3088 2052 2976] and Feng Zhenxing [7458 2182 5281] (9)

Interval Method in Data Flow Analysis......He Yanxiang [0149 3508 4382] (17)

Theoretical Calculation and Experimental Investigation of Diffraction of Electromagnetic Waves by Dielectric Cylinders......Bao Zongti [0202 1350 1879] (29)

On the Calculation of Atmospheric Absorption and Rain Attenuation of Millimeter Waves......Li Huanju [2621 3562 4251] and Zhang Zuwen [1728 4371 2429] (37)

Calculation of the Radiation of Slotted Cone by Means of the Dyadic Green's Function......Lu Shu [7627 6615], Wu Qinglin [0702 1987 7792] and Zhu Chongcan [2612 1504 3605] (46)

Research on the Production of Silicon Solar Cells by Ion Implantation Technique......Xu Zaigui [1776 0961 6311], Pan Xianzheng [3382 7359 2398], Qiu Wanchuan [6726 8001 1557] and Li Jincai [2621 6855 6865] (55)

The Synthesis of Crown Ethers by PTC Reactions......Wu Chengtai [0702 2052 3141], Yuan Biao [5913 1753], Zhang Hongqi [1728 4767 2475] and Shu Jiayou [2631 0857 2589] (63)

The Synthesis of Crown Ethers (I) The Synthesis of Novel Multidentate Crown Ethers......Huang Zaifu [7806 6528 4395], Li Minyi [2621 2404 6146], Zu Zhongmin [2629 1813 2404] and Yu Zongyuan [0827 1350 3293] (69)

Preliminary Study of the Synthesis and Interfacial Poly-Condensation of 1, 1-(4-hydroxyphenyl)-1-aryl-2, 2, 2-Fluorochloro Ethane ......Liu Daoyu [0491 6670 3768], Wang Hongzuo [3769 3163 4373] and Zhang Xianliang [1728 0341 0081], et al. (75)

Studies on the Artificial Host Egg of the Endoparasitoid Wasp Trichogramma (3)--The Artificial Host Egg Shell of Trichogramma Formed by Thin Membranes 01 and 02......Cooperative Research Group of Artificial Host Egg of Trichogramma, Hubei Province (80)

Comparative Observations on the Wholeday's Meiotic Frequency in Male-Sterile and Its Maintainer Lines of Rice......Li Rongqian [2621 1369 0578], Liu Lihua [0491 4539 5478] and Zeng Zizhong [2582 1311 0022] (84)

Comparison of Anther Size and Pollen Amount between Different Fertility Restorer Lines in Wheat with Relation to the Fertility Restoration......Xu Naiyu [1776 0035 3842], Wang Xulian [3769 6079 5571] and Li Yongzhou [2621 3144 3166], et al. (92)

Studies on the Birds of Wuhan (I)--Fauna and Analysis...... Hu Hongxing [5170 7703 5281], Tang Ruichang [0781 3843 2490] and Tang Zhaozi [0781 0340 1311] (97)

On the Dialectic Properties of the Concept of Derivatives and the Theory of Limits......Zhu Qiuchang [2612 3061 7022] (114)

9717
CSO: 4008

PUBLICATIONS

TABLE OF CONTENTS OF 'DIANZI JISHU,' OCT 80

Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 10, Oct 80 inside front cover

[Text] Short Channel MOS Technology
Ye Anzuo [5509 1344 4373] and Wang Jianshan [3768 0369 0810].............. (1)

Ion Beam Sputtering Etching
Chen Guoming [7115 0948 2494] el al, Shanghai Institute of Metallurgy...... (5)

XSQ-1 Swept-frequency Display
Li Mingguang [2621 2494 0342], Shanghai 26th Radio Plant.................. (10)

Intermediate-frequency Delay Time Decoding Method for PAL Signals
Hu Nanzhong [5170 0589 6988], Shanghai Industry University................. (14)

Integrated Circuit Digital-analog Converter, Part II
Lu Ming [7120 7686].. (17)

Start-synchronous System of a Small Digital Voltmeter
Shao Weiming [1776 0251 2494], Dalian Engineering College................. (21)

Computer Analysis of HA-1144 Video IF Amplifier, Part II
Jiang Huimin [3068 8396 3046]... (25)

Harmonics Radar
Pan Zhiheng [3382 1807 1854] and Gu Shangjie [7357 1424 2638]............. (29)

Lectures

Lectures on Transducer (7): Piezoelectric Energy Converter, Part I
Guo Yuankai [6665 0337 1956].. (32)

Electronics Circuits

A DC Voltage-regulated Power Supply That Is Compatible With Large Amplitude Fluctuating City Voltage
Jiang Tzushu [1203 5261 1859]... (39)

Introduction to New Knowledge

Line Frequency Ringing Interference in Television and Its Elimination
Wang Deyuan [3768 1795 3104].. (40)

Experience in Linear Circuit Noise Suppression
Zhang Jie [1728 0512]... (45)

Experience Exchange

Two New Types of Dual-frequency Antenna
Yao Zhenrong [1202 3791 2827]... (42)

Voltage-frequency-converter
Yu Xianglin [0205 4161 2651].. (43)

Stability of Black Level in Color Television
Mu Qianqi [4476 0578 0967].. (44)

Two Measurement Problems of Digital Voltmeter
Pan Kuchen [3382 6253 5256]... (46)

News Brief

Multi-colored Liquid Crystal Display.................................. (20)

Infrared Telephone Receiver... (24)

Inside front cover: New Magnetic Tape

Questions and Answers

Two Items... (47)

9698
CSO: 4008

TABLE OF CONTENTS OF 'HUAFEI GONGYE,' OCT 80

Shanghai HUAFEI GONGYE [CHEMICAL INDUSTRY] in Chinese No 5, Oct 80 p 1

[Text] Experimental Research

A Study of Dynamic Models of Medium Temperature Exchange Catalysts B_{110}, C_{121}... Zhu Bingchen [2612 3521 6591] et al.......... 2
A Study on the Work Procedure of Reconstituting Low Temperature Exchange Catalyst, Using Waste Low Temperature Exchange Catalyst as the Raw Material...Honan Provincial Institute of Chemical Engineering.......... 6
A Study on Carbon Accumulation Resistance of Light Oil Steam Transform Catalyst...Institute of Scientific Research, Main Plant, Shandong Shengli Pentrochemical Factory..........11
Automatic Control Device of ZKY-M Gas Generating Furnace...Meter Work Section, Shanghai Nanhui Chemical Fertilizer Plant..........17
Determination of Magnesium Oxide in Phosphate Ore---the NaOH-TEA-EGTA Separation Volume Method...Qin Anrong [4440 1344 2837]..........24
Experiment of Using Humic Acid for Water Reduction in Wet-ground Phosphate Ore...Yu Xuechu [5713 2485 0443]..........27

Technical Reform Experience Exchange

Roller Type Conveyor...Wang Sichu [3769 1835 0443] et al..........31
Hard Polyvinyl Chloride [PVC] Flourine Exhaust Machine...Xie Zhiming [6200 1807 2494]..........33
Application of Cone-shaped Overflow Vortex Plate Unit in Desulfurization... Zhong Jixiang [6945 0679 4382]..........35
Application of Chestnut-oak Tannin Extract as an Oxygen Absorbent... Song Shixin [1345 0013 2450]..........39
Understandings in Prolonging the Life of the Converter Pipe...Yang Weimin [5017 5898 3046]..........41
Low Temperature, High Air Speed Reduction of EA-1 Type Ammonia Synthesis Catalyst and Its Application...Mu Zhong [4476 0022]..........46
Reclamation and Cyclic Utilization of Exchange Condensation Water... Zhao Guofang [6392 0948 2455]..........51
Measure for Damping Vibration of Pipes of the 2D7 Type Circulating Machine... Hong Chuntai [3163 4783 1132] et al..........52

Comprehensive Discussion

Xanthate Nitration Suppressing Agent...Zhai Yuhua [5049 3768 5478]............55

Evaluation of New Products

Evaluation of the A_{110} Type Ammonia Synthesis Catalyst of Nanhua Company... G. S. Benner............58

Discussion of Technological and Economic Policy

The Phosphate Rock Industry Must Formulate a Realistic and Practical Policy of Development...Dai Yuanfa [2071 5913 3127]............62

Brief News

Double Bag Packaging of Ammonium Bicarbonate Guarantees the Quality of the Product............66
Comprehensive Utilization of Residual Heat of Ammonia Synthesis Tower............66
Simple Device for Testing The Hardness of Coal Briquettes............68
Fast Method of Improving the Copper Content of the Copper Solution............69
Condition of Experimental Production of the New L47 (ϕ 4.7m) Water Cooling Tower Blower............70
Gas Chromatographic Analysis of Morphological Sulfur in the Raw Material Gas of Ammonia Synthesis............71
Application of Cryolite, a Byproduct of Phosphorus Fertilizer in Aluminum Industry............72

Conference News

Chinese Chemical Engineering Society Chemical Fertilizer Society Held a Phosphorus Fertilizer Production Technology Synposium in Shanghai............74
National Industry-wide Competition Conference of Key Phosphorus Fertilizer Factories Held in Tongling City............75
National Medium-Sized Nitrogen Fertilizer Plant Energy Conservation Synposium Held at Jiangxi Ammonia Plant............75
Chemical Fertilizer Industry Superior Products Judging and Selection Conference Held in Wuxi............77
Invitation to Subscribe to HUAFEI GONGYE [CHEMICAL FERTILIZER INDUSTRY] 1981..78

6168
CSO: 4008

PUBLICATIONS

TABLE OF CONTENTS OF 'DIANZI KEXUE JISHU,' NOV 80

Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 11, Nov 80 p 1

[Text] Review Article

Cloud Picture Telemetry Technique
Liu Chengbang [0491 2110 1620].. (2)

Special Topics

Laser Without a Cavity
Guo Guangcan [6753 0342 3503].. (8)

Burnout Prevention of Mixer Diode in Radar Receiver
Li Yang [2621 3142].. (11)

Applications of Operational Amplifier Principles in Stable Power Supply
Ni Benlai [0242 2609 0171].. (13)

Design and Analysis of Several Variable Phase Shifters
Yuan Xiaokang [5902 1321 1660].. (16)

Solid State Electric Eye--Low Voltage Variable Area Light Source
Feng Xiqi [7458 6932 3217] et al.. (21)

OCVD Method and Its Applications
Ruan Gang [7086 0474].. (23)

Interference Problems in Computer Peripherals Caused by AC Power Source
Zheng Peikun [6774 1014 0981].. (27)

Automatic Electronic AC Voltage Regulator
Zhou Chunfeng [0719 2504 7685] et al.. (29)

Special Topics Sequence

Measurement and Tuning of Practical Digital Circuits II--Using Semiconductor Components in Digital Electronic Circuits
Li Wenfeng [2621 2429 1496].. (31)

Analysis and Calculation of On-Off Regulated Power Supply, Part IV
Tang Genlin [0781 2704 2651].. (35)

Technology and Facility

Modifications in Evacuation Techniques for Black-and-White Picture Tube
Wu Huaan [0702 5478 1344].. (38)

Electronic Product

Introducing Chinese-Made TTL Digital Integrated Circuits Product Serial
Zhou Baojing [6392 0202 4842].. (42)

News Brief on Foreign Science and Technology.. (46)

Failure Prediction of Integrated Circuits
Light-Emitting GaAs Field Effect Transistor
Wide Capture Range Phase-frequency Locked Locp
25W GaAs FET
48 Digit Liquid Crystal Display
Compact and Low-heating Power Amplifier
Variable Color Light-emitting-diode

Front cover story.. (41)

National Software Discussion Meeting Held in Beijing.. (12)

Announcement.. (22) (37)

Principles and Performance of Automatic Element Insertion Machine of
Dyna-Pert Division, Emhart Company.. (47)

9698
CSO: 4008

AUTHOR: TANG Tianfu [0781 1131 4395]
XUE Yaosong [5641 5069 2646]
ZHOU Yangkang [0719 0111 1660]
et al.

ORG: All of Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences

TITLE: "The Characteristics of Carbonate Rocks and Their Sedimentary Environment of the Lower Tertiary Buxin Group in Sanshui Basin, Guangdong"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 249-259

TEXT OF ENGLISH ABSTRACT: The carbonate rocks of the lower Tertiary Buxin group in Sanshui Basin, Guangdong Province, spread along the basin's margin may be subdivided into seven deposit areas, were for the first were found foraminifera (Miliolids, Discorbidae, Nonionidae and Spirillinidae), worm tube (Sedentaria), algae and stromatolites. Judging from the data on petrology and paleontology, the area concerned was transgressed by sea waters during the Buxin epoch.

AUTHOR: LI Yuntong [2621 0061 6639]
LI Zishun [2621 1311 5293]

ORG: Both of the Institute of Geology, Chinese Academy of Geological Sciences

TITLE: "Gastropods from the 'Xuehuashan Formation' in the Jingxing District, Hebei Province, and Their Stratigraphical Significance"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 260-274

TEXT OF ENGLISH ABSTRACT: The "Xuehuashan formation" was assigned in 1930 to Pliocene by Wang Zhuquan on the basis of the physiography of north China. Gastropods collected by Wang from this formation were studied by Ping Chi who referred the said formation to the Lower Pliocene. The authors recollected and examined the gastropods from the same formation and found 19 species belonging to 7 genera, of which 7 new species are erected. Found in this gastropod assemblage have been Pupilla triplicatoides Steklov and Gastrocopta (Sinalbinula) conturbata Steklov, which are known from the Middle Miocene of Europe and central Asia. In addition, a number of genera and species discovered here are close to those of the Middle Miocene in the Precaucasus, described by Steklov. Consequently, the "Xuehuashan formation" is assigned to the Miocene.

AUTHOR: JIANG Peimo [3068 1014 6206]

ORG: Department of Geology, Beijing University

TITLE: "The Calculation Equilibrium Temperatures of the Ore-Bearing Rocks of the Fe-P Ore Deposits in Fanshan, Hebei, and Its Geological Significance"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 275-283

TEXT OF ENGLISH ABSTRACT: The equilibrium temperatures of diopside-clinoenstatite and diopside-magnetite in the different igneous rock zones of Fe-P deposits in Fanshan, Hebei, have been calculated by thermodynamic methods. The calculated temperatures coincide with the decrepitative temperatures of apatite, which are determined by decrepitation of fluid inclusions. Although the calculated temperatures of the rock zones show a small divergence in a few cases, the results of these studies indicate, on the whole, that the equilibrium temperature of apatite rock is the lowest, while that of the overlying and underlying zones increases gradually.

AUTHOR: DONG Zhenxin [5516 2182 0207]
ZHOU Jianxiong [0719 0494 7160]

ORG: DONG of the Beijing Graduate School, Wuhan College of Geology; ZHOU of the Institute of Mineral Deposits, Chinese Academy of Geological Sciences

TITLE: "The Typomorphic Characteristics of Chromites from Kimberlites in China and the Significance in Exploration of Diamond Deposits"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 284-299

TEXT OF ENGLISH ABSTRACT: Dealing with chromites from kimberlites in China, this paper gives the conclusions based on measurements of their physical properties (for example, a_o, N, D), more than 110 chemical analyses and over 60 electron probe analyses.

The physical and chemical properties of chromites from kimberlites vary in a wide range depending upon a number of parameters and they are obviously distinct from the chromites in other similar rocks. Properties of chromites in kimberlites vary in different areas, or in different diamond-bearing kimberlite zones in the same area, hence chromite is of significance in the exploration of diamond deposits.

The chromite from kimberlite is high in Cr_2O_3, low in Al_2O_3 and the ratio of

[Continuation of DIZHI XUEBAO Vol 54 No 4, Nov 80 pp 284-299]

Cr/(Cr + Al) $>$55 percent. The richer in diamond the kimberlite is, the higher ratio Cr/(Cr + Al) in chromite. In China the ratio Cr/Cr + Al) in chromites from kimberlites poor in diamond or without diamond is 55-80 percent, but the ratio in chromites from those rich in diamond is $>$80 percent. In similar rocks, this ratio in nearly all chromites is $<$80 percent. The analysis of Fe^{3+} shows that the chromites from the diamond-rich kimberlites are mostly Fe^{3+} rich varieties, while those from the kimberlites poor in or without diamond and similar rock are mainly Fe^{3+}-low varieties. Moreover, the ratio $\mathrm{Mg}/(\mathrm{Mg} + \mathrm{Fe}^{2+})$ of the former is found to be $<$65 percent, but that of the latter varies greatly, some being $>$65 percent. As for the physical properties, the most distinct feature of chromites in the kimberlites is their high a_o, generally $>$8.26 Å. Moreover, the chromites in the kimberlites are distinct from the others in having higher refractive indices (over 2.110), specific gravities ($>$4.4) and higher reflective indices.

AUTHOR: SHENG Zhonglie [4141 0022 3525]
LUO Mingjiu [5012 6900 3773]
LI Liangjun [2621 5328 7486]

ORG: All of Henan Bureau of Geology

TITLE: "Basic Geologic Features and the Chief Controlling Factors of a Porphyry Molybdenum Ore Belt in West Henan Province"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 300-309

TEXT OF ENGLISH ABSTRACT: The porphyry molybdenum ore belt in western Henan under study is a distinctly altered, zonally mineralized polymetallic ore zone of excellent prospect, which measures more than 100 km long by 15-25 km wide, forming a NWW-trending rectangle. Tectonically, it lies in the compound portion of the complex Qinling latitudinal tectonic zone and the Neocathaysian Taihang first-order uplift belt. It is bounded on the south by the late Yanshanian granite batholith (95 m.y.), while in its central and northern parts there occurs a series of small masses of early Yanshanian (170 m.y.) granite porphyry, diorite and various vein rocks of acid-intermediate composition.

A number of molybdenum ore deposits have been discovered: in the western mineralized belt the ore centers around Yechangping, while in the east it is around Nannihu, forming two sections of concentrated ore distribution. In addition, some

[Continuation of DIZHI XUEBAO Vol 54 No 4, Nov 80 pp 300-309]

deposits of tungsten, iron, copper, sulfur, lead, zinc, etc., in association with the Mo-deposits, are of large and medium sizes. Dispersion elements, such as rhenium, indium, cadmium, may also reach the industrial grade.

The main controlling factors of this porphyry molybdenum ore belt depend on the character of the magmatic activities and conditions of occurrence in the area concerned. The widespread significance is that the molybdenum-mineralization is closely related to the Yanshanian small hypabyssal intrusive bodies which are highly acidic, alkali and potash-rich. In time and space both the rock-forming and ore-forming processes are structurally controlled. Ore-belts, ore-fields and ore deposits are respectively subject to the influence of combination, arrangement, scale and nature of the tectonic system. However, there is no selection of age and lithology of country rocks during molybdenum mineralization in this ore belt.

AUTHOR: DU Qi [2629 3823]

ORG: No 4 Geological Team, Geological Bureau of Heilongjiang Province

TITLE: "The Alteration and Mineralization Features of the Duobaoshan Porphyry Copper Deposit"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 310-323

TEXT OF ENGLISH ABSTRACT: The Duobaoshan porphyry copper deposit is located within a composite stock, which is chiefly a medium-grained granodiorite with a K-Ar age of 292 m.y. (Late Carboniferous) and contains plagioclase-granitic stocks.

The accompanying alteration rock-association contains a quartz core, an inner zone of quartz-perthite-biotitization, a middle one of sericite-chlorite-quartz composition and an outer zone of propylitic alteration. The ore mineralization is restricted to the sericite-chlorite-quartz alteration zone, and it is controlled by spacing and orientation of the fractures, especially by intersecting fractures and faults.

Within the sericite-chlorite-quartz zone bornite appears to be concentrated chiefly in the central part, while the content of chalcopyrite increases from the central part outward, but abruptly diminishes near the periphery, leaving the pyrite as the predominant mineral.

[Continuation of DIZHI XUEBAO Vol 54 No 4, Nov 80 pp 310-323]

Telescopic and overlapping sequences of alteration mineral and sulfide assemblages are evident around the quartz core; an early quartz-perthite-biotite alteration with low molybdenite-chalcopyrite-pyrite mineralization is pervasively developed. Superposed on it is the strong sericite-chlorite-quartz alteration with associated chalcopyrite-bornite mineralization. These are, in turn, superposed by strong carbonate alteration with associated late carbonate-quartz-bornite-chalcopyrite veinlets.

After the formation of the copper ore zone, whenever it was intruded by late intrusives and superimposed by fractures and faults, the remobilization of existing copper mineralization more or less occurred corresponding to each event, and the copper tenor either increased or decreased.

AUTHOR: WU Bihao [0702 1801 6275]
QI Zuoming [4359 0146 2494]
WANG Mili [3769 1725 0500]
QU Jieyu [3255 3381 3842]

ORG: None

TITLE: "Geochemistry of Salt-Bearing Deposits in Basin Q, Hubei Province"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 54 No 4, Nov 80 pp 324-333

TEXT OF ENGLISH ABSTRACT: The geochemical characteristics of the distribution of both bromine and the original brines in salt-bearing basin Q were studied for the purpose of revealing the environments, formation conditions and the developing processes of salt-bearing deposits. This is beneficial to the prognostic study of potassium-magnesium salt deposits and has already obtained quite good results.

This preliminary investigation suggests that when the salt-bearing formation of group q was deposited, it was confined to a continental salt basin of sodium sulfate type, and soluble salts accumulated steadily in this rather large enclosed lake basin, resulting in a great thickness of salt-bearing formation. Under conditions of multicycles, sodium chloride and sulfate were continuously precipitated and at the same time potassium-magnesium-bromine-ions can be enriched in the lake

[Continuation of DIZHI XUEBAO Vol 54 No 4, Nov 80 pp 324-333]

brine, leading to the possible crystallization of potassium-magnesium salt from those oversaturated brines. The authors, therefore, have clarified preliminarily the mineral paragenesis, and the mechanism for the formation of sodium sulfate type brine; in addition, they have proposed a new model for potassium-salt precipitation in the continental salt lakes.

9717
CSO: 4009

AUTHOR: CHANG Man [1603 3341]

ORG: None

TITLE: "On Coupling Equation of Wave Propagation in the Inhomogeneous Plasma"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 343-352

TEXT OF ENGLISH ABSTRACT: Starting from Maxwell's equations and the moment's equations, we have derived the coupling equations of electromagnetic and electroacoustic waves in inhomogeneous compressible plasmas with electron density gradient under the action of external fields. Then the perturbation solution of electromagnetic and electroacoustic wave coupling equations is presented. Finally, a discussion is given on the coupling excitation mechanisms of electromagnetic and electroacoustic waves in such plasmas, showing that the coupling between different modes is the cause of their mutual transformation and the excitation process of these waves in homogeneous and compressible plasmas given by Cohen is only a special case of the present results.

AUTHOR: CHEN Yaowu [7115 5069 2976]

ORG: Institute of Space Physics, Chinese Academy of Sciences

TITLE: "On the Vertical Dynamic Transport and Its Effects in the Upper Mesosphere and Lower Thermosphere"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 353-367

TEXT OF ENGLISH ABSTRACT: A formula for vertical dynamic transport function is deduced from the molecular kinetic theory of gases. Instead of Nicolet-Mange's "mixing ratio," this formula can describe successfully the transition process from mixing to separation conditions in the upper atmosphere. Considering the observational data of turbulence motion in the upper atmosphere, the distribution models of the diffusion coefficient with height are presented, according to which the height distribution profiles of number density ratio, such as $n(Ar)/n(N_2)$, $n(He)/n(N_2)$, are calculated and compared with the rocket-borne mass-spectrometer's data. The distributions of main chemical components with height in the upper mesosphere and lower thermosphere are computed according to photochemical-dynamical transport theory. It is concluded that the photodissociation coefficient is coupled with number density profiles of molecular oxygen, and the system of equations involved must be solved numerically from upper to lower heights, in order to diminish the errors arising from the assumption of the photodissociation coefficient in computations.

AUTHOR: WU Jianzheng [0702 0256 1767]

ORG: Institute of Space Physics, Chinese Academy of Sciences

TITLE: "The Excitation Temperature of the Fine Structure Levels of the ^3P Ground State of Atomic Oxygen in the Thermosphere"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 368-375

TEXT OF ENGLISH ABSTRACT: In this paper, the effect of collisions of oxygen atoms in the thermosphere with electrons and neutral particles on the population of oxygen atoms in the fine structure levels of the ground state $2p^4\ ^3P$ is discussed. The excitation temperature of the fine structure levels at heights between 140 and 400 km was calculated for both night and day conditions in the 750K and 2000K model thermospheres. In the calculation, a series of values for the equivalent cross section for neutral particles impact de-excitation of $^3P_1$ level was adopted. Based on Takao Tohmatsu's suggestion derived from the study on the intensity ratio of the OI 1302 Å triplet in the day airglow, the lower limits of excitation temperature for various thermospheric conditions have been obtained.

AUTHOR: LI Qinzu [2621 2953 4371]

ORG: Seismological Bureau of Hebei Province

TITLE: "General Features of the Stress Field in the Crust of North China"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 376-388

TEXT OF ENGLISH ABSTRACT: The study of the stress field in the crust is a basic problem in earthquake study. The general features of the stress field in the crust under north China (φ 30-41°N, λ105-124°E) were obtained from analysis of the following data: (1) earthquake mechanisms which include fault plane solutions of earthquakes which occurred during the period 1937-1979 and composite fault plane solutions of weaker earthquakes in a period of more than 10 years; (2) earthquake fractures appearing on the earth's surface at the time of earthquakes; (3) the directions of major axes of isoseismals of 41 earthquakes of $M \geq 6$ in the time period from 143 to 1976; (4) geodetic results in regions of some major earthquakes. This is a fairly consistent stress field in which the maximum compressional axis is in the northeast-east direction and the minimum axis is in the north-northwest direction, both axes being nearly horizontal.

From the observations of several great earthquakes, the extent of this consistent stress field is larger than north China. For areas considerably removed from

[Continuation of DIQIU WULI XUEBAO Vol 23 No 4, Oct 80 pp 376-388]

north China, the stress field in the crust is essentially the same, showing that the origin of the stress field is not restricted to the crust of north China but to the tectonic movement on a much larger scale. The interactions between the Eurasian Plate, the Indian Plate and the Pacific Plate and the particular location of north China which is far from the margins of the plates are probably the main causes of the characteristics of the stress field in the crust of north China.

AUTHOR: LI Youming [2621 1635 6900]
SUN Yongzhi [1327 3057 2535]
YAO Zhenxing [1202 2183 5281]

ORG: All of the Institute of Geophysics, Chinese Academy of Sciences

TITLE: "A Practical Scheme on the Computation of Synthetic Seismogram Using the 'Reflectivity Method'"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 389-395

TEXT OF ENGLISH ABSTRACT: In this paper an effective practical scheme with regard to computing speed and storage is proposed for the calculation of body wave synthetic seismogram using the reflectivity method. Examples of synthetic seismograms corresponding to three crust models are given in the paper.

AUTHOR: YAN Dahua [0917 1129 5478]

ORG: Seismological Bureau of Shanghai

TITLE: "Short Periodic Induction Field of Geomagnetic Storms on Zo-Se and Electrical Conductivity in the Upper Mantle Beneath this Region"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 396-402

TEXT OF ENGLISH ABSTRACT: Geomagnetic storm-time variations observed at Zo-Se are analyzed for the study of the inductive response of the upper mantle. Some hidden periods ranging from 10-120 min are discovered after using the periodgraph technique. Among these, two distinct penetrating periods are estimated in accordance with a one-dimensional multistratifying model. It may be defined, from the first penetrating period, that the penetrating depth is about 90 km, with which the top of the high conductive stratification of the upper mantle is just in correspondence. It may also be estimated, from the second penetrating period, that the thickness of high conductive stratification is 42 km, between which and the upper one the conductivity ratio is about 17.

AUTHOR: WEI Qingyun [7614 7230 0061]
LI Dongjie [2621 2639 4634]
CAO Guanyu [2580 0385 1342]
et al.

ORG: All of the Institute of Geophysics, Chinese Academy of Sciences

TITLE: "Archaeomagnetic Research of Jiangzhai Relic, Neolithic Epoch"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 403-414

TEXT OF ENGLISH ABSTRACT: Some new results of archaeomagnetic research on the baked earth specimens from the Jiangzhai relic of Neolithic age are reported in this paper. The direction of the geomagnetic field at about 3900 BC in the Lingtong region where this relic is located was determined. The position of the virtual geomagnetic pole for this period was deduced according to the geocentric dipole model. The paleo-intensity was determined by using the Thellier method. The virtual dipole moment (VDM) and the corresponding reduced dipole moment (RDM) were also calculated for this epoch.

AUTHOR: WANG Banghua [3769 6721 5478]
LIN Shengbiao [2651 4141 5903]
DENG Yiqian [6772 0001 6197]

ORG: All of Chengdu Geological Institute

TITLE: "Magnetic Fields of Uniformly Magnetized Polyhedra"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 415-426

TEXT OF ENGLISH ABSTRACT: The magnetic fields of uniformly magnetized polyhedra are studied, and normalized expressions for evaluating their vertical, horizontal and total intensity anomalies (Z_a, H_{ax}, H_{ay} and ΔT) are derived. As an example for illustration, the process is given of reducing it to the equation of the magnetic anomalies of a plate with limited dimensions.

The magnetic anomalies of polyhedra are represented in this normalized expression as the functions of their magnetic parameters and the coordinates of their corner points. Since it is a twofold summation of the sides and faces of the polyhedron, this expression will be very convenient for operating on the computer.

AUTHOR: YANG Chuliang [2799 2806 5328]
YU Shoumian [0151 1108 4875]

ORG: Both of Shandong University

TITLE: "Propagation of Elastic Wave in a Cylindrical Bore Hole Containing a Fluid for Acoustic Logging"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 427-437

TEXT OF ENGLISH ABSTRACT: The propagation of an elastic wave in a cylindrical bore hole containing a fluid (for example, the muddy fluid is generally used) for acoustic logging is analyzed with a simplified model. Such a wave field may be looked upon as the superposition of partial waves which are classified according to different wave vectors along the axis of the hole. It is shown that, for the infinitely deep bore hole with single uniform rock layer outside it, the so-called "head wave" with maximum phase velocity $v_{zm} = c_2$ exists only for characteristic frequencies as shown in the formula, and partial waves with phase velocity $v_z > c_2$ and $c_2 > v_z > b_2$ are forbidden. Here, c_2 and b_2 are the longitudinal and transversal wave velocities in the rock layer outside the hole respectively. This result may be used to explain the so-called "filtering effect" of the hole as reported by Crawford, et al. It is also shown that, for the hole with more than one rock layer outside it, a "head wave" which has similar properties described above is present only under certain conditions.

AUTHOR: ZENG Jinguang [2582 6930 0342]
HUANG Qiang [7806 3856]
CHEN Shuxing [7115 1859 5887]

ORG: ZENG of Chengdu Geological Institute; HUANG of the Research Institute of Geophysical Prospecting for Petroleum, Ministry of Geology of China; CHEN of Fudan University

TITLE: "Seismic Modeling for Complicated Subsurface Structures"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 438-449

TEXT OF ENGLISH ABSTRACT: Seismic modeling is an important theoretical problem in seismic prospecting. This paper presents a modeling system in which ray tracing procedures are used to calculate the two-dimensional synthetic seismogram, with finite elements representing complicated subsurface structures, thus producing their theoretical section. The system can be applied to the modeling of lithology or geological structures, which would offer useful information for the interpretation. A general program for computing arbitrary complicated structures has been prepared. It proved effective in calculating a series of models for a certain seismic profile. These synthetic sections were displayed on television. The paper ends with a brief discussion and analysis of the results thus obtained.

AUTHOR: HU Xinkang [5170 1800 1660]
SHI Jinrui [4258 6855 3843]
REN Jianguo [0117 1696 0948]

ORG: All of the Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Preliminary Study of the Relation Between a Kind of Pressure Wave in the Atmosphere and Earthquakes"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 23 No 4, Oct 80 pp 450-458

TEXT OF ENGLISH ABSTRACT: An observational result of the relation between a kind of pressure wave in the atmosphere and local earthquakes is reported.

The period of the pressure waves is between tens and 500 seconds; its amplitude is between 5 and 100 Pa; the dominant period of the waves changes very little. The waves occur in groups, each consisting of three to five waves. The identification of the waves is easy, because their waveform is smooth. The order of magnitude of horizontal phase speed for these waves is 10 m/s, and the waves are transverse.

For the local earthquakes studied in this report, about 70 percent of them were preceded by such low frequency pressure waves within 30 hours before the earthquake event.

9717
CSO: 4009

END

JPRS 78758

14 August 1981

China Report

SCIENCE AND TECHNOLOGY

No. 118

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78758

14 August 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 118

CONTENTS

APPLIED SCIENCES

BCM-2 Minicomputer Developed
(BEIJING RIBAO, 18 Jul 81).. 1

Briefs

DJS-140 High Speed Computer Developed 2

LIFE SCIENCES

Report States China Among Leaders in Burn Treatment
(Qiu Yunde, Zhang Yifu; GUANGMING RIBAO, 24 Jun 81)............ 3

PUBLICATIONS

Table of Contents of 'QIZHONG YUNSHU JIXIE' Nos 1-2, 1981
(QIZHONG YUNSHU JIXIE, Nos 1-2, 1981).......................... 5

Table of Contents of 'JI CHUANG' No 6, 1981
(JI CHUANG, No 6, 1981)... 8

ABSTRACTS

AERONAUTICS

HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE], Jul 81............... 10

ARMAMENTS

BINGGONG XUEBAO [ACTA ARMAMENTARII], No 2, May 81).................. 13

CONSTRUCTION

SHUINI [CEMENT], No 5, 10 May 81.................................... 15

METALLURGY

JINSHU RECHULI [HEAT TREATMENT OF METALS], No 5, 1981................. 16

MODERNIZATION

XIANDAIHUA [MODERNIZATION], No 6, 16 Jun 81.......................... 17

OIL GEOPHYSICAL PROSPECTING

SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING], No 3, 1981..... 18

SCIENTIFIC INSTRUMENTS

YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS], No 2, 1981... 20

SEISMOLOGY AND GEOLOGY

DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY], No 2, 1981..................... 28

APPLIED SCIENCES

BCM-2 MINICOMPUTER DEVELOPED

Beijing BEIJING RIBAO in Chinese 18 Jul 81 p 2

[Text] The Beijing Computer Research Institute has recently successfully developed the BCM-2 minicomputer capable of processing Chinese characters. This multi-purpose, easy-to-operate computer may be used in science, communications, medicine, national defense and business management. A small number of the BCM-2 minicomputer has already been produced.

A technician operating the Chinese character output.

CSO: 4008/425

BRIEFS

DJS-140 HIGH SPEED COMPUTER DEVELOPED--Recently, the DJS-140 electronic digital computer was successfully developed by the Beijing Computer Plant No 3. Having passed product assessment, a number of this computer model will be put into production. Designed jointly by units of the Fourth Ministry of Machine Building, the DJS-140 is a high-speed model of the 100 series computers produced by the PRC. Compared with other models from the 100 series, the DJS-140 is characterized by a high rate of operations capable of reaching 800,000 calculations per second; it is functionally complete, has 9 types of peripheral equipment, a variety of software systems and a large capacity internal memory unit. Useful in a wide range of applications in industry, agriculture, national defense and scientific research, this computer is ideal for performing scientific calculations, data management and real-time controls. The testing unit of the assessment committee examined the overall computer system and the resulting calculations of all test questions were the same as those of comparable types of foreign computers. As of 16 April, this computer has been in operations for 600 hours without any malfunctions which exceeded the 200 hour continuous operation testing requirement. At present, this computer is still in continuous and stable operations. [Text] [Beijing BEIJING RIBAO in Chinese 11 Jun 81 p 1]

CSO: 4008/426

LIFE SCIENCES

REPORT STATES CHINA AMONG WORLD LEADERS IN BURN TREATMENT

Beijing GUANGMING RIBAO in Chinese 24 Jun 81 p 1

[Article by Qiu Yunde [6726 0061 1795] Zhang Yifu [1728 6318 1788]]

[Text] The reporters learned at the International Burns Discussion Meeting held on 21-23 June in Shanghai that since the successful rescue of the burn victim Qiu Caikang [6726 6299 1660] in 1958, the work of research and treatment of burns in China has continued to be progressive and creative and China has been among the most advanced ever since.

For a long time, the burn treatment centers and research organizations in the various provinces and cities of China have carried out clinical studies and theoretic research on key problems of treatment of burns, and have created unique methods of treatment and individual viewpoints in theory. For example, the Department of Burns of Ruijin Hospital of Shanghai Second College of Medicine conducted more than 10 years of research on the treatment of large area third degree burns (burns are divided into the first, the second, and the third degrees; the third degree is the most serious.) Through the use of various special methods the problem of using a small amount of autograft to cover about 90 percent third degree burn areas was resolved. This is an extremely difficult problem. After a large area of the victim's own skin has been burned, serious rejection problems will occur, if allografts are used for transplants. In order to overcome this difficulty, China's physicians combined clinical observations with pathological studies of transplants with a mixture of autografts and allografts. They discovered some very strange phenomena [sic]. Through the adoption of certain measures, they preliminarily resolved the problem of rejection in case of allograft for large area third degree burn victims. Under the condition of relative scarcity of allografts, the People's Liberation General Hospital, the Ruijin Hospital, etc., inspired by the successful foreign experience of using pigskin to make a biotic ointment, applied pigskin as a substitute for allograft to be mixed with autograft for transplant and successful results were obtained.

As the technique of surgical approach to burns was continuously improved, the rate of cure for large area burn victims in China rose continuously, so that some extremely large area burn victims who would have to be regarded as completely hopeless were rescued. In 1977, Ruijin Hospital successfully rescued 100 percent of burn areas [sic]. Of these Yang Guangming [2799 0342 2494], a victim of third degree burns over 94 percent of his body was the first successful recovered case ever reported in the world. Hospitals of other provinces and cities also saved many difficult-to-cure burn victims. For example, the First Hospital of Beijing College of Medicine successfully treated cases of 98 percent burned areas. One victim, a young woman by the name of Wang Shifen [3769 0013 5358], suffered third degree burns over 88 percent of her body, and was one of those who recovered. At Beijing Jishuitan Hospital 2 victims of 3D degree burns over 90 percent of their bodies recovered. One of the 2 was a 2-year old child who suffered 3D degree burns over 94 percent of the body. At the Third Military University of Medicine, more than 70 percent of the total burn cases treated recovered. Of victims of 3D degree burns above 50 percent of the body, the recovery rate reached 60 percent. In such places as Harbin, Tianjin, etc. more than 70 percent of 3D degree burn cases also recovered.

On the International Burns Discussion Meeting, burns specialists, plastic surgery specialists, and scientists coming from China's 19 provinces (cities) exchanged experiences and investigated and discussed clinical work, basic theory, and plastic restoration with specialists and scientists from the United States, Japan, Yugoslavia, Australia, and Hong Kong.

6248
CSO: 4008/400

PUBLICATIONS

TABLE OF CONTENTS OF 'QIZHONG YUNSHU JIXIE' NOS 1-2, 1981

Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese Nos 1 and 2, 1981

[No 1, 1981 p 1]

[Text] The Calculation of Metallic Structure Vibration for Portal Cranes......Li Shiying [2621 1102 3467] and Fang Dunxun [2455 2415 0534], both of the Shanghai Harbor Machinery Plant; Ye Caimin [5509 2088 3046], Institute of Sciences, Ministry of Communication and Transportation (2)

Load Analysis for Four Lattice Truss Crane Girders...... Song Jiazong (9)

Limiting Stress Calculation of Telescopic Sleeve Cylinders ......Zhang Rending [1728 0088 1353], Shandong Institute of Technology (18)

Research on Limiting Stress of Telescopic Sleeve Cylinders ......Zhang Yuanjia [1728 0337 0857], Shandong Institute of Technology (22)

Computer-solution for the Electro-parameter Functions of Electric Magnetic Vibrators......Wang Shiqing (27)

Design and Calculation of the Non-contact Profile Roller Type Reverse Checking Devices......Cao Bingzhong [2580 4426 1813], Zigong Transportation Machinery Plant, Sichuan (32)

First Lecture on "Finite Element Method"......Zhang Guorui [1728 0948 3843] and Zhang Rongkang [1728 2837 1660], both of Shanghai Jiaotong University (42)

WXD 03-9 Type High Altitude Operation Platform......Chu Mingxiang [0443 6900 4382], Hoists and Conveyances Research Institute (48)

The Synopsis of HE Type 5 Ton Double Speed Electric Hoist ...... (55)

Semi-automatic Machine Used for the Machining of Crane Sheaves......Wang Shuze [3769 2885 0463], Dalian Hoisting Machinery Plant (57)

Package Delivery by Using Container Bag......Gu Kuizhang (60)

Technical Characteristics of the Metallurgical Cranes Made by English A. A. Co. ...... (65)

A Test of Inflated Film Air Cushion......Sheng Ronggen [4141 2837 2704], Jiangnan Shipyard (72)

The Application of the SCR Rectificated DC Speed Regulating System for Hoisting Mechanism...... (75)

[No 2, 1981 p 80]

[Text] Load Capacity of Crane Hooks During Yielding Period and Strengthening Period......Yuan Wenbo [5913 2429 0130] and Lu Jiali [0712 1367 4539], both of the Chinese Mining College (1)

Calculation and Choice of Travelling Trackway for Electric Overhanging Crane......Gong Benzhi [1362 2609 2535], Tianjin Hoisting Equipment Plant (9)

Low Temperature Brittle Fracture in the Steel Construction of Cranes--An Application of Fracture Mechanics......Song Jiazong, et al. (16)

Air Cushion Belt Conveyor......Mei Jingwu [2734 4842 2976], Shanghai Harbor Scientific and Technological Research Institute (23)

Derricking Balance of Bucket Wheel Stacker-Reclaimer...... Zhu Qianyou [2612 0051 2589], Dalian Heavy Machinery Plant (27)

Water Cushion Test......Wang Wanyong [3769 8001 3057] and Zou Shenghua [6760 0581 5478], both of the Hoists and Conveyances Research Institute (32)

Second Lecture on the "Finite Element Method"......Zhang Guo rui [1728 0948 3843] and Zhang Rongkang [1728 2837 1660], both of Shanghai Jiaotong University (38)

The Design of Elevators with Three-dimensional Motion Locus ......Li Youjian (49)

An Improvement on the Machining Process for Screw Conveyor Helix......Qian Jingheng [6929 2529 5899], Zhenjiang Forestry Machinery Plant (58)

Improvements of Angle Steel Conductor......Chen Mu [7115 7195], Shanghai Hoists and Conveyances Machinery Plant (65)

Calculation and Choice of Idlers......Bai Jinhui (66)

Research for Dynamic Coefficient of Mobile Cranes...... Hiroshi Ito (70)

Mass or Weight Change......Zhao Jiewen (79)

9717
CSO: 4008/408

PUBLICATIONS

TABLE OF CONTENTS OF 'JI CHUANG' NO 6, 1981

Beijing JI CHUANG [MACHINE TOOL] in Chinese No 6, 1981 inside front cover

[Text] Design and Research

Design and Experimental Research of Turbulent Flow Type Chip Conveyor......Zhang Qicheng [4545 0796 2052], Qinghua University (1)

Power-adjusting and Leakproof Design of the Ram of Slotting Machine Model BA5063......Fu Jingrong [0265 2529 2837], Fushun Machine Tool Plant (5)

Enclosed Norton Mechanism......Gu Jianhua [7357 1696 5478], Shanghai Machine Tool Factory No 11 (7)

Transmission Error Compensation for CNC Open-loop System ......Wang Feilong [3769 7378 7893], Huazhong Institute of Technology (9)

Experiments and Calculation of Automatic Ac- and Decelerating Circuits......Bian Runjie [6708 3387 2638], Qiqihar Machine Tool Plant No 2 (11)

Technology and Equipment

Analysis and Application of the Gear Honing with Worm Honing Wheel......Guo Zhenguang [6753 2182 0342], Hunan May First Machinery Plant (13)

The Problem of the Color of Machine Tools in China...... Liang Zian [2733 1311 1344], Hunan University (19)

Inspection and Measurement

Digital Display of μ-level Inductosyn Model ZBS-4 and Its Accuracy Analysis......Li Liangwan and Li Mou (24)

Digital Rod Type Magnetic Rule Instrument......Tan Feng [6223 6912], Machine Tool Research Institute, First Ministry of Machine Building (27)

Calculation of the Error of Cylindricity......Liang Rongming [2733 2837 5407], Beijing Institute of Electromechanical Devices (31)

Maintenance and Retrofit

Logical Design of Main Electrical Driving System of Boring Mill......Cai Zixing [5591 5261 5281], Zhongnan Mining and Metallurgy College (35)

Braking of Lathe, Model C616......Hua Shanhong [5478 0810 7703] and Yao Zhenqi [1202 2182 6386], both of the Beijing Machinery Plant (38)

9717
CSO: 4008/405

AUTHORS: QIAN Xuesen [6929 1331 2773] et al.

ORG: None

TITLE: "Views of China's Top Scientists During Session of Scientific Council of Chinese Academy of Science"

SOURCE: Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese Jul 81 pp 2-5

ABSTRACT: In May 1981 the Chinese Academy of Science held its fourth conference of the Scientific Council in Beijing. The conference was attended by 400 council members who represent the top scientific talents in China. The views expressed by some of the key speakers are as follows: 1) Qian Xuesen [6929 1331 2772] spoke on the importance of developing management science to attack the many social problems facing China today; 2) Li Yinyuan [2621 5593 6678], Guan Weiyen [4619 1602 3508], Zhang Zong [4545 4844], Hong Chaosheng [3163 2600 3932], and Li Lin [2621 2651] jointly discussed the importance of solid-state physics research and its potential impact on national economy and defense; 3) Su Buqing [5685 2975 7230] suggested the application of mathematics in various production processes; 4) Shi Changxu [1597 2490 4872] spoke on the importance of developing new

[continuation of HANGKONG ZHISHI Jul 81 pp 2-5]

materials and research in material science; 5) He Zehui [0149 3419 1979] talked about the proper attitude of self-confidence and perserverance in pursuing scientific research; 6) Li Xun [2621 5651] encouraged Chinese scientists to devote efforts in technology research as well as basic research; 7) Zhang Wenyu [1728 2429 5940] emphasized the importance of experimental research as the foundation of theoretical science; 8) Wu Zhenkai [0702 1767 6963] suggested improvements in the living standards for middle-aged scientists in China so they can devote all their efforts to scientific work.

AUTHOR: DONG Tien [5516 1131]

ORG: None

TITLE: "The Highly Mobile Small Air Cushion Boat"

SOURCE: Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese Jul 81 p 14

ABSTRACT: The small air cushion boat is typically 3 to 4 meters long, over 1 meter wide, and weighs less than 200 kg. Because of its small size, light weight, and high mobility, it is often used as a short range emergency vehicle traveling between off-shore islands, in swamps, or along winding rivers. Small air cushion boats are also used by military and police units for high speed transportation. The relatively simple structure of small air cushion boat makes it feasible for individuals to design and construct the boat or to assemble it from available parts.

AUTHOR: YUAN Hang [6678 5300]

ORG: None

TITLE: "Space-Based Radar"

SOURCE: Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese Jul 81 pp 20-21

ABSTRACT: Space-based radar has been proposed in recent years as part of an early warning system to detect low-flying enemy airplanes or cruise missiles. In order to achieve continuous coverage and to direct concentrated microwave energy through a narrow beam for target tracking and detection, a large antenna must be placed in an earth-synchronous orbit. To install such an antenna requires the use of a space shuttle as the transporting vehicle. Typically, a space-based radar uses a phased-array antenna whose beam can be steered electronically by an onboard computer. In addition to air defense applications, a space-based radar can also be used for air traffic control, soil temperature measurement, and as part of a communication network.

AUTHOR: PU Linfa [3184 2651 4099]

ORG: None

TITLE: "Laser Boresighting"

SOURCE: Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese Jul 81 pp 28-29

ABSTRACT: Boresighting is a procedure of aligning the axes of airborne weapons and fire control systems with the airplane axis so they meet strict design tolerances. In this article the basic principles of the conventional optical boresighting technique is introduced and its disadvantages are pointed out. The newly developed laser boresighting technique and how it achieves improved alignment precision are explained. It is also pointed out that by using laser boresighting and improving the quality control in weapon manufacturing and assembly, considerable savings in ammunition can be realized by eliminating actual boresight testing.

3012
CSO: 4009/388

AUTHOR: WAN Daozheng
WANG Changwen

ORG: None

TITLE: "The Synthesis and Properties of N-(2,2,2-Triritroethyl)-N-Nitro Aminoethanol Nitrate"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 2, May 81 pp 20-23

TEXT OF ENGLISH ABSTRACT: The above compound was first published in 1961 in USP by Henry Feuer, who synthesized its intermediate by the "Mannich Reaction" of nitroform, aminoethanol and formaldehyde. In China it was obtained by other methods in 1962. All of these researchers considered it an unstable, useless explosive.

We have found that it can be synthesized by the Mannich-Nitrosation reaction to increase its yield and recrystallized from dilute NHO_3 to improve its stability. The data of the properties of this pure compound, the thermal-hydrolitic stability and detonation properties show that the compound remains a valuable explosive if it is used under certain conditions.

AUTHOR: MA Baohua

ORG: None

TITLE: "The Optimization Design of the Fuze Helical Spring"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 2, May 81 pp 24-32

TEXT OF ENGLISH ABSTRACT: This paper discusses a method of the optimum design of the cylindrical helical compression springs used in fuzes. By using the regression analysis method, a regression equation of σ_b-d of special purpose carbon spring steel wires and a regression equation of the Wahl factor-spring index have been established. Based on fully stressed criteria, a mathematical model for spring optimization design has been built. The model is a constrained nonlinear programming problem. Considering that the diameter of the steel wire is discrete, the problem can be worked out with a direct search method and the program is made in FORTRAN.

This method was used to redesign the existing fuze springs under similar initial conditions. It has been proved that this method is better than the traditional ones.

AUTHOR: DONG Yongzhong
CHEN Tingfen

ORG: None

TITLE: "Experimental Research on the Vertical Penetrating Process of High Velocity Long Rod Armor-piercing Projectiles"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 2, May 81 pp 36-47

TEXT OF ENGLISH ABSTRACT: Through experiments conducted with high velocity long rod APDS vertically impacting the thick homogeneous metal plates, this paper analyzes the fracture process of the penetrator and plate during penetration and the influence of the penetrator material microstructures and properties on the process, and presents some high-speed laser photographs during penetration and some pictures of the adiabatic shear bands and metallic flow lines in the residual bodies of the penetrator and the plates. In the experiments, not only the muzzle velocity and the impact velocity of the projectiles, but also the sizes of the holes and the plastic deformation regions around the hole are measured. Finally this paper presents a suggestion for the design of the armor-piercing projectiles and the choice of its materials.

AUTHOR: JIANG Haozheng
LIU Naisheng

ORG: None

TITLE: "Experimental Research of Effective Analog Simulation of Shaped Charge Warhead with Hemispheric Large Diameter Liner"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 2, May 81 pp 48-57

TEXT OF ENGLISH ABSTRACT: This paper uses the law of geometric similitude to perform experimental research on analog simulation for a large diameter shaped charge warhead with hemispheric liner, obtaining the regularity of penetration depth L, diameter D of the surface and hole volume V of targets at various stand-off H. Based on the experimental values, this paper, in considering various influential factors, derives useful empirical formulas of effective calculation of shaped charge warheads with hemispheric liner.

9717
CSO: 4009/360

AUTHOR: ZONG Benmu [1350 2609 2606]
HUANG Youfeng [7806 2589 0023]

ORG: Both of Bureau of Cement, Ministry of Construction Materials

TITLE: "Strengthen Equipment Management and Improve the Level of Equipment Management"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 5, 10 May 81 pp 2-4

ABSTRACT: Equipment management is an important part of managing an enterprise. It is the precondition if the enterprise is to realize good quality, low cost, safe, and balanced production to guarantee the completion of the State's plan. In order to manage the equipment well, the work should include the following aspects, the paper maintains: (1) Planned inspection and repair of the equipment should be strengthened; (2) Efforts should be given to the research on techniques of early forecast, inspection and monitoring of deterioration and damage of equipment and its parts; (3) Carry out work of simplification, serialization, and standardization of types and parts specifications of cement equipment; (4) Perform good basic work of equipment management, including record keeping, setting up quality standard for inspection and repair work, and maintaining complete sets of drawings of the equipment.

AUTHOR: WANG Yueke [3769 2574 0668]

ORG: Jinan Cement Plant

TITLE: "Several Viewpoints in Improving the Quality of Standing Kiln Cement"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 5, 10 May 81 pp 28-32

ABSTRACT: Quality instability of clinker is a common problem in today's standing kiln cement production. The paper discusses this problem in the following 10 aspects: (1) The effect of the ratio of height to diameter of the kiln on the clinker quality depends upon many other factors; (2) Enlargement of the opening also depends upon other conditions; (3) Height of kiln cover and chimney is important; (4) Composition of the mixture should be reasonably chosen; (5) A low iron mixture should be investigated; (6) The raw material should be as homogenous as possible. (7) The fuel affects the quality of the clinker; (8) A stable ratio of coal to raw material improves the stability of granulation of the clinker; (9) Quality management measures guarantee the quality of the cement product; (10) Work procedure parameters should be adjusted when the standard for the soil processing method (mainly the quantity of water used will be different) becomes official on 1 Jan 80.

6248
CSO: 4009/380

AUTHOR: TANG Renguang [0781 0088 0342]
WANG Hongyin [3769 1347 0603]
MA Xinqing [7456 0207 7230]

ORG: All of Zhengzhou Research Institute of Machinery

TITLE: "Research on Ion Carburization Technology"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 5, 81 pp 1-6

ABSTRACT: Experiments of ion carburization was carried out with 3 types of steel: 20, 18CrMnTi, 20Cr at varying parameters of time, temperature, duration, and current to study the quality of the carburized surface. Results demonstrate that ion carburization is a heat treatment technique of high efficiency, high quality, low energy consumption, and nonpolluting. Problems concerning the ion carburization speed, concerning the quality of the carburized surface layer, concerning the advantage or disadvantage of adding a heater, and concerning the method of saving energy are discussed. The experimental procedure and results are analyzed and reported.

AUTHOR: TANG Jixu [0781 49494872]
OU Jinyu [2962 6855 3768]

ORG: Both of Chongqing Research Institute of Special Steel

TITLE: "Research on Heat Treatment of New High Speed Steel W6Mo5Cr4V2Al"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 5, 81 pp 29-34

ABSTRACT: Due to the fact that W6Mo5Cr4V2Al steel can easily oxidize and decarbonize, during annealing, protective measures, such as protective gas or a sealed box, must be adopted. When it is heated in a saline bath furnace, the saline solution must be properly deoxidized. Due to the fact that it can easily overheat to cause the sizes of the crystalline grains to be uneven, the maximum temperature for quenching should not exceed 1240°C. The isothermal annealing technique and minimum temperature quenching are recommended. Due to the fact that the critical point is relatively high (Ac_1 = 835-885°C), a relatively high temperature (890-920°C) annealing is recommended. Within the temperature range of 950-1150°C, the W6Mo5Cr4V2Al steel is found to have good thermoplastic property. It is preliminarily concluded that a bainite treatment can improve the toughness of this steel.

6248
CSO: 4009/392

AUTHOR: LAN Tian [5663 1131]

ORG: None

TITLE: "Microorganisms Purify Sewage"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese No 6, 16 Jun 81 pp 14-16

ABSTRACT: Chemical, physical and biological methods can be used in the purification of sewage. The former two methods entail the risk of producing secondary pollution, a risk that is not presented by biological methods. In these biological methods, a range of microorganisms are capable of converting poisonous organic compounds present in sewage into harmless substances. Various soil irrigation methods rely on the ability of soil microorganisms to purify sewage that is percolated through the soil or run along its surface. In biological filtering, thin films of microorganisms attached to a filter material oxidize organic pollutants; their activity is helped by other microorganisms present in the filters. In the rotating disk method, disks rotating vertically in sewage troughs bring microorganisms alternately into contact with the sewage and the air. Biological oxidation ponds are a major antipollution approach, and were successfully employed on Yar Lake, Hubei. An anerobic method, the methane fermentation method, not only is successful in treating sewage with high organic content, but also produces methane which is usable as a fuel.

AUTHOR: TONG Yin [2717 7299]

ORG: None

TITLE: "A Radar-Destroying Thunderbolt: The Anti-Radar Guided Missile"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese No 6, 16 Jun 81 pp 18-19

ABSTRACT: Although radar can be thwarted by chaff or electronic countermeasures, it is most effective to put it out of action by destroying the station itself. Fire control radars, which present the greatest threat to aircraft, are the easiest for antiradar missiles to home on. The warheads destroy the antenna horns, waveguides, reflectors and rotation mechanisms, using various fuse types such as doppler shift and amplitude comparison mechanisms. Seeker heads compute the difference between the missile's heading and the direction to the emitter and issue course correction signals to the flight control mechanisms. The missiles must be launched at a high angle so as to avoid being decoyed by secondary reflections from the ground surface. To deal with intermittent signals from rotating radars, program-controlled guidance is used in midcourse, and the seeker systems are used only for terminal guidance. Western antiradar missiles have included the Shrike, Standard and Matra. Some technical advances are: replaceable seeker heads, additional IR terminal guidance, making it possible to find radars even if they are suddenly turned off, directional memory devices, and seekers which home on any radiation, not merely that of radar antennas.

8480
CSO: 4009/353

AUTHOR: WU Liexu

ORG: None

TITLE: "The Principle and Application of the Sign Bit Processing Method"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 3, 1981 pp 16-24

TEXT OF ENGLISH ABSTRACT: In this paper, the possibility of recovering the amplitude from the sign bit record is proved by the analysis of noise. The method and effect of the sign bit horizontal stack are also introduced. Some experiments show that the sign bit horizontal stack method emphasizes the coherence of reflections, thus enhancing weak reflections on the section. It is pointed out in this paper that with the development of the sign bit technique, methods which were considered too difficult to employ in the past may now be taken advantage of.

AUTHOR: CHEN Wenhua

ORG: None

TITLE: "Audio-frequency Magneto-telluric Method and the Direction of Future Study"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 3, 1981 pp 62-74

TEXT OF ENGLISH ABSTRACT: This paper features the development of the audio-frequency magneto-telluric method both in and outside China, and discusses briefly the characteristics of the audio-frequency magneto-telluric field and the principle of the method. Equipment needed is listed and examples of its application are given. A tentative proposition is put forward for future research on the method.

AUTHOR: MA Mingde

ORG: None

TITLE: "A Comment on the Wave Equation Migration Method"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 3, 1981 pp 75-77

TEXT OF ENGLISH ABSTRACT: A study of the propagation of seismic waves shows that the wave equation migration method currently used neglects the influence of phase characteristics. Also, the parabolic type equation commonly used now is derived from the hypothetical conditions of ray theory, so it is not complete with respect to the nature of waves. This is precisely why the results of wave equation migration are presently less than ideal.

9717
CSO: 4009/361

AUTHOR: HUANG Lanyou [7806 5695 0645]
WANG Keding [3769 0344 1353]
JIN Heming [6855 7729 7686]
LI Chengda [2621 2052 6671]
ZHONG Zhiping [6945 3112 1627]

ORG: All of the Scientific Instrument Factory, Chinese Academy of Sciences

TITLE: "The Design and Adjustment of a DX-4 Transmission Electron Microscope"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 1-9

TEXT OF ENGLISH ABSTRACT: When we were designing our microscope, we had in mind a short, compact 100 kV high resolution basic instrument with future expandabilities. The main specifications are: $f_0 = 1.6$ mm, $C_s = 1.6$ mm, $C_c = 1.5$, $\Delta V/V = 5 \times 10^{-6}$/min, $(\Delta I/I)_{0b} = 2 \times 10^{-6}$/min. Factors which contributed in making the column short are: use of a side entry stage, a mini-lens within the iron core of the objective lens to act as the first intermediate lens, and minimizing the focal lengths of the lenses, the column height being only 1.8 m. The focal length of an objective can be expressed as $f_0/\sqrt{H(D/S)^2} = \left(31 \frac{V_r}{(NI)^2} + 0.19\right) S$. Taking the derivative and setting of $df_0/NI = 0$, we obtain minimum $f_0 = 0.38\sqrt{S^2 + D^2}$ and $V_r/(NI)^2_{min} = 0.00613$. For lenses other than the objective we can use the expression for the

[Continuation of YIQI YIBIAO XUEBAO No 2, 1981 pp 1-9]

projector lens. Using similar arguments we obtain $f_{1min} = 0.774(NI)_m$. $(NI)_m$ can be calculated from the expression $V_r/(NI)_m^2 = 0.0048 + 0.00065\ S/D$. The magnetic circuits were designed using model calculations. Different models were used for different parts of the magnetic circuit. The alignment problems of the DX-4 electron microscope are discussed, e.g., measurement of voltage stability. With the sheath of the cable disconnected from the ground and connected to an oscilloscope, a detection sensitivity better than 5×10^{-7} at 100 kV for 20 Hz fluctuations is achieved.

AUTHOR: GUO Laixiang [6753 0171 4382]

ORG: National Institute of Metrology

TITLE: "A Method of Calculating Flux-gate Magnetometer"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 10-17

TEXT OF ENGLISH ABSTRACT: A method of calculating a flux-gate magnetometer excited by a square-wave generator is presented in this paper. It is well known that the main difficulty in calculation is that of non-sinusoidal and nonlinear iron-core circuits. Therefore, the emphasis of this paper is on discussing the solution process of this kind of circuit with a ring-core, to which a square-wave voltage is supplied. Due to a quite high resistor inserted in the excitation circuit, the magnetic modulator is excited by square-wave voltage in form, but is actually excited by pulse current. Moreover, from the condition of the constant current source, the expressions of even harmonic flux have been derived by means of even illustrated analysis. The result shows the peak value of output voltage modulated by the signal field H_0 increases in one direction with H_0, but decreases in the opposite direction. Therefore, it provides the basis for the use of the peak-difference demodulator.

AUTHOR: YAO Junen [1202 7486 1869]
YU Jianye [0151 1696 2814]
HUANG Tongjie [7806 0681 4634]
et al.

ORG: All of the Scientific Instrument Factory, Chinese Academy of Sciences

TITLE: "A Dual X-ray Dispersive Crystal Spectrometer and Its Fitting to a Scanning Electron Microscope"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 18-24

TEXT OF ENGLISH ABSTRACT: This dual X-ray spectrometer consists of two linear-type full focus dispersive spectrometers for analyzing elements. Each contains two Johann-type crystals, i.e., LiF, PET or TAP, STE (CER). The take-off angle of the X-ray is 30°, the radius of the Rowland circle is 140 mm, and the Bragg angle (2θ) ranges from 25 to 120°. These spectrometers can be equipped on the Chinese DX-3 SEM and turn it into a high-grade EPMA-SEM. In this paper the geometric tolerances of the linear-type curved crystal fully-focusing X-ray wavelength spectrometer have been calculated. The preparation of analyzing crystals, fitting the spectrometer to a SEM, increasing peak intensity of diffraction lines, reduction of background and providing a coaxial optical microscope on the specimen chamber are discussed. The overall geometric accuracy and reproducibility of the spectrometer should be

[Continuation of YIQI YIBIAO XUEBAO No 2, 1981 pp 18-24]

1' and 6" respectively. The resulting performances are as follows: range of detectable elements is from B^5 (Be^4) to U^{92}. Wavelength resolving power $\Delta\lambda/\lambda$ is $1\sim5 \times 10^{-3}$ ($Na^{11}\sim U^{92}$) or $1\sim5 \times 10^{-2}$ ($B^5\sim F^9$), spectra of $K_{\alpha1}$, $K_{\alpha2}$ of Cu, Fe, Ti; $VK_{\alpha1}$, $VK_{\alpha2}$ and TiK_{β} of Ti-6Al-4V alloy can be discriminated, and the limit of detectability is 10^{-3} percent ($Na^{11}\sim U^{92}$) to 10^{-2} percent ($B^5\sim F^9$) order.

AUTHOR: PANG Zhongyu [1690 0112 0056]
WANG Huailiang [3769 2037 0081]

ORG: PANG of the Central Iron and Steel Research Institute, Beijing; WANG of the Tianjin No 6 Radio Factory

TITLE: "Automatic Measurement of AC Magnetic Properties"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 25-34

TEXT OF ENGLISH ABSTRACT: Magnetic parameters of equivalent fundamental frequency, such as complex permeability $\dot{\mu}$, inductance permeability μ_L, magnetic dissipation factor D_m and quality factor Q, as well as the total core loss P_c, can be measured by the automatic bridge technique. In a bridge circuit, the principle of vector impedance ratio measurement is applied. Fundamental frequency character is obtained by a multiplication device to overcome the difficulty due to the nonlinearity in AC magnetic measurement. Dual-slope A/D conversion method is used for measuring various ratios. With some other auxiliary circuits, parameters of the hysteresis loop, such as maximum induction B_m, magnetizing force H_m, peak permeability μ_p, residual induction B_T, coercive force H_c and squareness ratio B_T/B_m can also be measured with a single instrument. All digital results of measured parameters are displayed or printed in a magnetic unit system for direct reading. Accuracy of measurement is ± 1~3 percent. Working frequency is from 50 Hz to 5 kHz. Measuring

[Continuation of YIQI YIBIAO XUEBAO No 2, 1981 pp 25-34]

function and range change are controlled by logic circuit. This design automatizes the measurement of all AC magnetic properties and results in convenience in designing an automatic measurement system for magnetic parameters by a microprocessor.

AUTHOR: HU Changxin [5170 2490 0207]

ORG: Institute of Mechanics, Chinese Academy of Sciences

TITLE: "Fundamental Principle and Design Method of Coil with Magnetic Core for Measuring High Pulse Current"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 35-43

TEXT OF ENGLISH ABSTRACT: In this paper, the fundamental principle and design method of a measuring coil with a magnetic core for measuring pulse high current is explained in accordance with general physical laws. The results are given and compared with the orthodox shunt or measuring coil by using an aerated medium (i.e., the Rogowski coil). The method can measure lower pulse current, improve low frequency response and simplify technology. Furthermore, non-constant magnetic permeability μ will not influence the linear relationship between currents under a certain condition. The frequency characteristic and amplitude characteristic of the coil are given. In addition, there are photographs of the measured current waveform, constructional scheme and the advantages of the coil.

AUTHOR: BAO Xuecheng [0545 1331 6134]

ORG: Shanghai Institute of Metrology

TITLE: "An Investigation of the Analytical Method of Kinematic Characteristics of the Cine Escapement Mechanism"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 44-51

TEXT OF ENGLISH ABSTRACT: Due to the wide application of computers, it is possible to make an accurate quantitative analysis of kinematic characteristics of the cine claw escapement mechanism. In this paper, a set of formulas is introduced as a numerical solution for the kinematic characteristics of two types of claw escapement mechanisms using coordinate calculation and vector methods. These formulas can be conveniently programmed. An approximate formula is also introduced with the film guide effect taken into consideration.

AUTHOR: None

ORG: GYQ Group, Tianjin University and the First Machine Tool Factory of Tianjin

TITLE: "Instrument and Measurement of Pitch Error for Spiral Bevel Gears"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 52-65

TEXT OF ENGLISH ABSTRACT: In this paper, a highly precise measuring principle of the pitch error for spiral bevel gears and the new technique used in the instrument are described.

The pitch error is an important item in gear accuracy. Most measurements of the pitch error are carried out by the comparative measuring principle. As the comparative measurement is used for a spiral bevel gear, two feelers cannot be set at the same position in two adjacent corresponding flanks. However, because the pitch errors at various positions of the face width are not equal, the pitch errors in the gear cannot be indicated exactly by the measured data. The absolute measuring principle is employed in our instrument. A precise moire-fringe grating is used. The pitch error can be measured automatically. This instrument is suitable for bevel gears with various reference angles, cylinder gears with various profiles (including shaving cutter, slotting tool) and index plates, etc. δt_{Σ} is recorded on a paper chart. The δt_p and $\delta_x t$ are printed.

[Continuation of YIQI YIBIAO XUEBAO No 2, 1981 pp 52-65]

A frequency multiplier with phase-locked loop is used to obtain 1000 frequency multiplication for the moire-fringe signal so that the quantizing error of the pulse can be reduced. A "multiply Z counter" is used. All kinds of tooth numbers can be measured. The stepless multiplier which is made up of a "multiply Z counter" and a "phase-locked tracking frequency multiplier" may be used for other cases. A special purpose digital computer which consists of decade counters has been developed.

AUTHOR: WANG Jinshan [3769 6855 1472]
GAO Fuwen [7559 4395 2429]
GAO Weizheng [7559 4850 6927]
ZHANG Bide [1728 1764 1795]

ORG: All of Beijing Normal University

TITLE: "A Study of a NMR Magnetometer Using Flowing Water"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 66-72

TEXT OF ENGLISH ABSTRACT: This paper describes an experimental instrument of a nuclear magnetic resonance magnetometer using flowing water. The principle, structure and initial experimental results are given in this paper. This instrument can be used to measure not only the strong magnetic field and homogeneous field, but also the weak magnetic field, the range of which is from 300 down to 0.023 Gausses, accurately. It can also be used to measure non-homogeneous magnetic fields.

AUTHOR: ZHANG Yide [1728 0001 1795]

ORG: Lanzhou University

TITLE: "Some Corrections for the Measurement Method of Series Resonance"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 73-83

TEXT OF ENGLISH ABSTRACT: The problem of how to measure the true inductance L_x and the true quality factor Q_x of the inductor by means of the measurement method of series resonance has been considered. The respective formulas, by which L_x and Q_x are calculated according to different measurement modes, are given and their validity confirmed by the experiments. The results show that the most precise result of L_x and Q_x values may be obtained by combining the series inductor measurement method with the tuning frequency mode.

AUTHOR: LI Jiabao [2621 1367 1405]

ORG: Research Institute of Metals, Chinese Academy of Sciences

TITLE: "The Non η Corrected Side Inclination Method in X-ray Stress Measurement"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 84-94

TEXT OF ENGLISH ABSTRACT: In this paper, a stress calculating formula for non η corrected side inclination method in the measurement of a side declining angle surface sample is introduced. A large systematic error may appear if an ordinary or η corrected side inclination method is used in the stress calculation for the non η corrected side inclination one. The formula is based on some new measuring techniques. In the end, the systematic error may be eliminated or minimized.

AUTHOR: WANG Yongchu [3769 3057 0443]

ORG: Chungqing Institute of Industrial Automation Instruments

TITLE: "The Analysis of Developmental Tendency of PID Regulator"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENTS] in Chinese No 2, 1981 pp 95-106

TEXT OF ENGLISH ABSTRACT: The PID regulator is one of the most important industrial control instruments. It is widely used in industrial production process control. Although it is proved that the current PID regulator is an optimal regulator for processes characterized by $Ke^{-\tau s}/(TS+1)$ or $Ke^{-\tau s}/(T_1S+1)(T_2S+1)$, yet it exposes some disadvantages. For example, its functions are incomplete and its turning parameters are coupled with each other. Furthermore, these regulators cannot adapt to nonlinear or time-varying processes. This paper describes an advanced PID regulator from the point of view of classical and modern control theory. There are two features, i.e., its derivative action acts only on the measuring path and not the set point's path; the integral feedback signal is fed externally and not internally. This paper analyzes the adaptability of the regulator to the cascade control system, float-limit control system and override control system for protection from the integral windup. The PID regulator should be improved to suit nonlinear and time-varying processes, and it should especially be required to develop diversified function in respect to the nonlinear PID regulator and the adaptive

[Continuation of YIQI YIBIAO XUEBAO No 2, 1981 pp 95-106]

PID regulator. Finally, this paper describes a dual-mode regulator with state-variable dynamic compensation which is very useful for processes with quick response and large disturbance.

9717
CSO: 4009/304

AUTHOR: FENG Wei [7458 3837]
WANG Yongcai [3769 3057 2088]
DENG Yuren [6772 4416 0088]
HOU Yanzhen [0186 1750 3791]

ORG: All of Hebei Seismological Bureau

TITLE: "Experimental Study on Radon Emanation of Saturated Rock under Ultrasonic Vibration"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 1-7

EXCERPTS FROM ENGLISH ABSTRACT: This paper illustrates an experimental study on the influence of ultrasonic vibration upon the microstructure and emanation process of saturated rocks. It was found by scanning electron microscope observation that specimens under ultrasonic vibration, whether on the ultrasonically irradiated sides or on the non-ultrasonically irradiated sides, all show a large number of fissured traces, i.e., microcracks. Therefore, it can be inferred that under the ultrasonic vibration the development of microcracks provided an outward-diffusing "passage" for the sealed radon to take part in the emanation process.

The experimental results show that the rock emanation process is clearly related to the ultrasonic vibration. Its mechanism is rather complicated. It is reasonable

[Continuation of DIZHEN DIZHI No 2, 1981 pp 1-7]

to consider that prior to the failure of the rock the expansive microcracking produced acoustic emission, i.e., ultrasonic vibration, leading to a constant emanation from rocks in a significant amount which may be regarded as a probable precursory information of radon.

AUTHOR: YE Hong [5509 3163]
ZHANG Wenyu [1728 2429 6735]
YU Zhishui [0060 0037 3055]
XIA Qin [1115 0530]

ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "The Seismicity and Recent Crustal Movement in the Himalayan Region"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 9-21

EXCERPT FROM ENGLISH ABSTRACT: In this paper three aspects of analysis are made for the recent crustal movement in the Himalayas on the basis of earthquake data recorded from 1897-1976.
1. The characteristics of the present active faults in this region were studied by the fault plane solutions.
2. The vectors of the tectonic movement in the lithosphere blocks were calculated by the null vector method.
3. The rate of the crustal slip was estimated from the seismic moment data.
In light of the analysis mentioned above, a model of recent crustal movement in the Himalayas is tentatively presented.

AUTHOR: ZHAO Wenfeng [6392 2429 1496]

ORG: Liaoning Seismological Bureau

TITLE: "Continental Rift Valley System and Seismic Activities in Northeast China"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 23-29

TEXT OF ENGLISH ABSTRACT: Northeastern China is restricted by the regional stress field, and within it the NE trending Xialiaohe and Songliao rift valleys have developed. The continental basement is filled with loose clastic sediments of continental facies, from 1000 to 5000 meters in thickness. From the rift borders lava of olivine basalt and hot water springs were ejected, and, as a result, rings were formed as the earthquake-control zones. The mechanism of the rift valley formation could be viewed as a reflection of the underthrusting of the Pacific Plate.

AUTHOR: ZHENG Binghua [6774 3521 5478]
GUO Shunmin [5716 7311 3046]
XU Haomin [1776 1170 3046]

ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "Preliminary Study of Principal Features of the NW and NWW Trending Fault Structures in the Yanshan Region"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 31-40

TEXT OF ENGLISH ABSTRACT: Based on recent field investigations, the principal features of the NW trending fault structure in the Yanshan region are summarized in this paper.

By analyzing structural, seismological and geophysical data, the authors demonstrate the space distribution, formation, development and movement mode of the NWW trending basement fault zones, as well as their relation to seismicity. It is suggested that the NWW trending fault zone can be attributed to a crustal fault, controlling both the development of the fault block structure and recent seismicity. The fact that the NW faults spread en echelon and cluster into a zone is an indication of a NWW fault zone in the superficial strata. Moreover, the movement mode of the zone under investigation has a very close relationship with the relative motion of the

[Continuation of DIZHEN DIZHI No 2, 1981 pp 31-40]

fault block structures. Since Mesozoic and Cenozoic periods, in addition to the differential movement, this fault zone was of a shearing motion which had very obvious physical changes during the periods from the Late Cretaceous to Early Tertiary.

AUTHOR: TANG Rongchang [0781 2837 2490]
LU Liankang [7120 5114 1660]

ORG: Both of the Sichuan Seismological Bureau

TITLE: "On the Seismogeological Characteristics of the 1976 Songpan-Pingwu Earthquakes"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 41-47

TEXT OF ENGLISH ABSTRACT: This paper discusses the seismogeological background of the Songpan-Pingwu earthquakes, their seismicity, the characteristics of tectonic stress field and the conditions of the seismogenic structures in the region under investigation.

Judging from the location of the epicenters of three strong shocks along the Huya fault, the contour of their synthetic isoseismals and the agreement of fault plane solutions with the occurrence of the Huya fault, the authors have come to a preliminary conclusion that the events studied were caused by the dip-slip displacement of the NNW trending Huya fault with a slightly sinistral component and under the action of the nearly EW trending tectonic stress field.

AUTHOR: GAO Weiming [7559 4850 2494]
LI Jialing [2621 1367 7227]
SUN Zhuyou [1327 4554 0645]

ORG: GAO of the Center of Earthquake Analysis and Prediction, National Bureau of Seismology; LI and SUN both of the Shandong Seismological Bureau

TITLE: "Tectonic Conditions of the Occurrence of Strong Earthquakes in Shandong Province"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 49-56

TEXT OF ENGLISH ABSTRACT: From the analysis of the distribution of strong earthquakes, the deep-seated crustal structures and average conditions, the authors of this paper attempt to divide the faults within the earth's crust into six groups and to estimate the depth and characteristics of seismo-pregnant layers. The motion of upper mantle materials, faulting and seismicity are a common source-contemporaneous. The occurrence of strong earthquakes is directly controlled by the activities of both deeply penetrating faults and faults of basaltic layers.

AUTHOR: PENG Yimin [1756 0001 3046]
LI Dingrong [2621 7844 1369]
XIE Zhenzhao [6200 2182 6856]
WANG Ande [3769 1344 1795]
LIU Qingsi [0491 3237 3123]

ORG: PENG of the Wuhan College of Geology; LI, XIE and WANG all of the Seismogeologic Team, National Bureau of Seismology; LIU of Beijing Teacher's University

TITLE: "Some Features of Contemporaneous Faults in the Beijing Plain and Their Significance"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 57-64

TEXT OF ENGLISH ABSTRACT: From the data obtained from the seismogeological work in the Beijing plain, the authors consider all of the main active faults in this region to be of contemporaneous nature and originated at the same time as the deposition took place. In our opinion, the study of contemporaneous faults is of great significance. At the end of this paper a general morphological model for contemporaneous faults is presented.

AUTHOR: HE Shisong [0149 1853 2646]

ORG: Research Institute of Liaoning Corporation of Metallurgy and Geological Exploration

TITLE: "On Neotectonics of the Hunhe Fault Zone"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 65-68

TEXT OF ENGLISH ABSTRACT: The Hunhe fault zone is a western extension of the Shenyang-Dunhua Mishan fault and there can be found evidence of Pre-Sinian movement. It is suggested that the faulting of the Hunhe fault zone was significant in Mesozoic time and more intensive and frequent in the Tertiary and Quaternary.

Based on geologic, morphologic and seismic data, this paper illustrates a tracing of the neotectonic movement since the Tertiary. Actually, this fault acts as one of the main faults of the Cathaysian tectonic system. In general, this paper deals only with the Shenyang-Qingyuan section.

AUTHOR: YAO Yanzhi [1202 1750 0037]
FANG Zhongjing [2455 0112 2529]

ORG: Both of the Institute of Geology, National Bureau of Seismology

TITLE: "Brief Report on the 'Symposium on Tancheng-Lujiang Fault Zone'"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 2, 1981 pp 69-80

EXCERPT FROM ENGLISH ABSTRACT: The Symposium on the Tancheng-Lujiang fault zone held at Weifang, Shandong Province, on 1-10 November 1980, was organized by the Geological Society of China, accompanied by a field trip. The problems of regional geological investigations, exploratory survey for ores, geophysical prospecting, seismogeology and image interpretation have been thoroughly discussed.

All representatives came to the following common understanding: (1) The Tancheng-Lujiang fault zone is a gigantic fault zone in east China, related to the formation of ores and earthquakes; (2) this fault zone has been subjected to a complex process in formation and evolution with a great variety of motive modes at different stages and periods and is characterized by the complicated geomechanical nature of compressive shear and tension, on the one hand, and of left-lateral and right-lateral displacement on the other; (3) it is a fault zone that is still active at present.

9717
CSO: 4009/308

END

JPRS 78819

25 August 1981

China Report

SCIENCE AND TECHNOLOGY

No. 120

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78819

25 August 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 120

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Modern Missile, Satellite Tracking Station Opens
(TIANJIN RIBAO, 30 Jul 81).. 1

Inorganic Synthesis Applied in Developing Optical Fiber Materials
(Yuan Zihua, et al.; ZIRAN ZAZHI, No 4, 1981)................... 2

Briefs
Miniature Computer 9
Guangdong Computer Center 9

PUBLICATIONS

Table of Contents of 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' No 1, 1981
(SHENGWUHUAXUE YU SHENGWUWULI JINZHAN, No 1, 1981)............ 10

Table of Contents of 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' No 2, 1981
(SHENGWUHUAXUE YU SHENGWUWULI JINZHAN, No 2, 1981)............ 13

Table of Contents of 'XINLI XUEBAO' No 2, 1981
(XINLI XUEBAO, No 2, 1981).. 16

Table of Contents of 'ZHONGHUA SHENJING JINGSHENKE ZAZHI' No 2, 1981
(ZHONGHUA SHENJING JINGSHENKE ZAZHI, No 2, 1981)............ 19

Table of Contents of 'GAONENG WULI YU HE WULI' No 3, 1981
(GAONENG WULI YU HE WULI, No 3, 1981)......................... 22

Table of Contents of 'HUAXUE TONGBAO' No 5, 1981 (HUAXUE TONGBAO, No 5, 1981).................................... 25

ABSTRACTS

COMPUTER SCIENCE

DIANZI JISUANJI DONGTAI [COMPUTER REVIEW], No 6, Jun 81................ 28

ELECTRONICS

DIANLI JISHU [ELECTRIC POWER], No 7, 5 Jul 81........................ 29

DIANZI JISHU [ELECTRONIC TECHNOLOGY], No 6, 1981....................... 31

MEDICAL EXPERIMENTS

JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL], No 3, Jun 81... 32

TELECOMMUNICATIONS

DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION], No 4, Apr 81......... 34

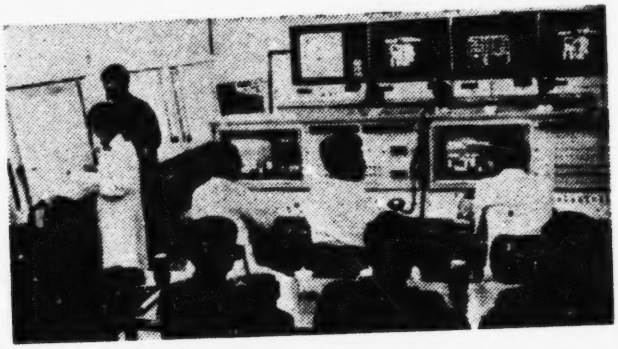
WATER CONSERVATION

SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY], No 1-4, 6, 1981.................................. 35

MODERN MISSILE, SATELLITE TRACKING STATION OPENS

Tianjin TIANJIN RIBAO in Chinese 30 Jul 81 p 4

[Text] The National Defense Scientific and Technological Commission has constructed a complete and modern ground tracking and control system in order to develop China's most advanced scientific undertakings. This system would ensure the successful completion of scientific testing of guided missiles, satellites and rockets in space.



The dispatch office of the newly built central command post.

CSO: 4008/449

APPLIED SCIENCES

INORGANIC SYNTHESIS APPLIED IN DEVELOPING OPTICAL FIBER MATERIALS

Shanghai ZIRAN ZAZHI [JOURNAL OF NATURAL SCIENCES] in Chinese No 4 1981 pp 264-266

[Article by Yuan Zihua [5913 0796 5478], Zhang Keli [1728 0344 4539], Wang Jianhe [3769 1969 0149] of Wuhan University: Application of Inorganic Synthesis in the Development of Optical Fiber Materials]

[Text] Laser fiber optics communication is a new communications technology. Its characteristic is that it can use wide frequency bands and it has a large communications capacity. A thin optical cable can carry 1 million conversations and is significant in establishing multipurpose television networks for scientific and technological exchange, communication of information, color television, photo transmission, telegraph and telephone. And as computing technology and automatic control technology and automatic control technology progress rapidly, it will provide a reliable means to the exchange and transmission of massive amounts of information and data. Optical fibers are made of fine glass fibers that are as thin as silk. They differ from ordinary electrical cables. They do not use copper, aluminum, lead and such ferrous metals, they are not affected by interference from electromagnetic fields, they do not fear dampness and corrosion, they are light, they have good security characteristics and they have special meaning to the military. Over 10 years, each nation has competed in the development and progress has been fast. Fiber optics has already developed to become a modern and advanced means of communication.

The study and application of optical fiber in communications are closely related to the progress of low loss optical materials. Optical materials of the past had a high loss property. Up to 1967, the most transparent and superior optical glass still had an optical loss of 100 decibels/kilometer. This means the energy of light passing through an optical fiber of 1000 meters long will dissipate to only 10^{-100}. Such a high loss makes it difficult for transmission even over a distance of 10 meters. Therefore, at the time, people believed that relying on fiber optics for communication was almost hopeless. In autumn of 1970, Corning Glass and Bell Laboratories of the United States consecutively used chemical purification to eliminate impurities with the largest optical absorption and synthesized pure silicon dioxide glass and obtained fibers with a loss of 20 decibels/kilometers (1) which could be used in communications. From then on, the research in low loss fiber materials developed prosperously, the rate of optical loss in fibers dropped, thus promoting the rapid development of optical fiber and laser communications. Now the loss in optical fibers has already dropped to below 0.5 decibel/kilometers, and optical fiber communications has approached applicability. The application of optical fiber in communications is also rapidly penetrating into the fields of civilian communications, military and scientific and technological fields.

Purity of Low Loss Fibers and Raw Materials

Obtaining low loss optical fibers is closely related to the purity of the raw materials used for the synthesis of fibers. A lot of data and research point out that the causes producing loss in optical fibers can be categorized as follows:

1 Optical loss

A Loss by scattering

Original scattering by the material is related to the composition of the material.

Scattering due to unevenness of the composition of the material is related to the techniques of chemical synthesis.

Scattering due to physical defects of the material is related to the conditions at time of manufacturing.

B Loss by absorption

Original absorption by the material is related to the composition of the material.

Absorption by impurities is related to the purity of the raw material.

In high loss fibers, besides scattering loss produced by uneven composition and structural defects of the material due to an uneven thermal field and imperfect techniques, absorption by impurities is a main cause of loss. For example, in soda-lime glass, when 4/millionth of iron and 6/10 millionth of copper are present, loss due to optical absorption will reach at least 120 decibels/kilometer. When using a type of silicon dioxide glass of a concentration of total impurities of below 1/millionth, loss due to absorption can be reduced to within the range of 10 decibels/kilometer (2).

Harmful impurities causing absorption by the material are transient metallic ions, ions of oxyhydrogen radicals and colloids. The outer atomic layer of transient metals such as iron, cobalt, nickel, vanadium, chromium, manganese all contain unsaturated d electrons. Under the action of external conditions, the outer layer of electrons easily oscillates or jumps, especially when encountering strong external coordination fields, splitting of the d energy level and the d-d jump produce absorption in the ultraviolet and visible light range. As a result, the transient elements produced different ligand structures and multivariate valence states at the time of forming the chemical compounds. In the glass, various different colors are produced (3), and differences in the absorption of light energy by some ions occur (4).

To produce a type of glass ehich has a sufficiently low absorption loss and which can be used for optical fibers in communications, Corning Glass and Bell Laboratories believe the total concentration of transient metallic ions must be lower than 1/millionth while the concentration of individual ions must be lower than 1/100 millionth (2,5,6).

In long distance communications, the loss in the optical fiber must be even lower, the corresponding purity of the material required is higher, and demands upon the individual elements is even higher. For example, at 1 decibel/kilometer, copper is 0.8 ppb, OH^- is 30 ppb.

For low loss fibers, the oscillatory absorption caused by the oxyhydrogen radical cannot be neglected. It has strong absorption peaks (1) at 0.72, 0.95, 1.4, 2.8 μm. For example, when the concentration of OH^- is 1 ppm, the optical loss produced will be 1.25 decible/kilometer ($\lambda = 0.95$ μm).

If transient metallic ions and OH^- are mixed into the material, they are very difficult to eliminate. Therefore ways must be found to remove them before synthesizing silicon dioxide glass. This first requires that the raw material must be subjected to a high degree of purification, and during the course of synthesis, impurities brought about by environmental pollution must be carefully prevented. Purification of matter requires chemical purification methods. Precise purification requires the use of various means of inorganic synthesis, such as extraction by solvents, ion exchange, distillation and redistillation, recrystallization and growing crystals, vacuum evaporation and migration by thermal diffusion, thermal decomposition and gas phase sedimentation, electrolytic refining and regional smelting. Purification of certain specific substances requires the use of a certain method of purification or a series of purification methods according to the different chemical properties and physical characteristics. Therefore obtaining highly pure raw materials is a complex and precise work. The application of inorganic synthesis techniques has stimulated continuously renewed development of semiconductor materials, and has also greatly promoted the initial development of optical fiber materials, and important means to obtain optical fibers of even lower loss was provided. The lower the loss in the optical fiber, the higher the demand upon purity. When matter reaches a highly pure state, to further lower the impurities by one magnitude presents greater difficulty, and this requires skillfully applying the methods and principles of inorganic synthesis to study, explore and seek the best method.

Application of Inorganic Synthesis in Developing Optical Fibers

The manufacturing process of optical fibers is a process of chemical reactions and sedimentation. Progress of the reactions is related to the temperature of the reaction, pressure and concentration of the reacting substances. It is also related to the properties of the reacting substances and the mechanism of the reactions. The control of these conditions directly affects the rate of production, distribution of the contents and the growth of the crystals of the material.

Natural quartz and quartz refined by the oxyhydrogen flame contain OH^- and are therefore unsuitable for manufacturing optical fibers. Now, optical fiber materials are mostly produced by plasma chemical sedimentation or chemical gas phase sedimentation in a tube. Chemical gas phase sedimentation in a tube involves the injection of $SiCl_4$ and O_2 into a continuously rotating quartz tube. Outside the tube, several sets of oxyhydrogen flame burners (or other high temperature heat source) which can be moved along the axial direction are used to heat the tube causing $SiCl_4$ and O_2 to react and produce SiO_2 which settles onto the inner wall of the tube. After several rounds of sedimentation, a layer of SiO_2 of an appropriate thickness is obtained. Finally, the content melts and condenses into a rod shaped quartz (See Diagram 1).

To produce an optical fiber with a variable refraction gradient, during the process of sedimentation, $POCl_2$ (or $GeCl_4$, $TiCl_4$) can be added which will increase the refraction. If BCl_3 (or BBr_3, fluorides) are added, the refraction can be reduced. The method of chemical gas phase sedimentation inside a tube can avoid the effects of the atmosphere and environmental pollution, and it is even easier to obtain pure and low loss optical fiber materials. Its shortcoming is that the sedimentation rate is slow, the operation is not continuous, the yield is low. The method of using plasma chemical gas phase sedimentation outside a tube is continuous production, the yield is large, but the process is greatly affected by the environment and water vapors and low loss optical fibers cannot be easily obtained. Therefore, new manufacturing techniques for optical fiber materials must be sought to suit the needs of practical developments. The improved gas phase axial sedimentation method involves injection of $SOCl_2$ into the gas phase chemical reaction to eliminate the effects of the atmosphere and the effects of hydrogen compounds contained in the raw material by reducing the OH^- content in the materials. During synthesis, hydrogen compounds react with oxygen to form water vapor which spreads into the glass:

$$H_2 0_{steam} + (\equiv Si - 0 - Si \equiv)_{glass} = 2(\equiv Si - OH)_{glass}$$

The concentration of OH^- produced is generally proportional to the square root of the atmospheric pressure of the steam. When these OH^- are excited by the laser, they produce oscillation, and absorption of corresponding wavelength occurs. To enable the OH^- to reach a sufficiently low limit, chlorosulfoxide is added during synthesis, thus obtaining the predicted results. At a high temperature, chlorosulfoxide can react with OH^- . In the silicon dioxide glass produced by sedimentation using this method, the higher content of OH^- in 1977 has already been successfully reduced to 0.3ppm in 1978 and 0.03ppm in 1979 (7).

Within the wavelengths from 0.7 um to 1.0 um, Fe^{2+} and Cu^{2+} respectively into Fe^{3+} and Cu^+ .

$$Fe^{2+} \rightleftharpoons Fe^{3+} + e \qquad Cu^{+} \rightleftharpoons Cu^{2+} + e$$

Controlling the atmosphere of 0_2 and CO during sedimentation enables the equilibrium to be controlled at the lowest point of loss of optical absorption. Adding trace amounts of $As_2 0_3$, $Sb_2 0_3$ can mask harmful impurities and the same results can be realized, thus avoiding repetitive purification processes (8,9).

Because of new principles in synthesis and applications, the manufacturing methods for fibers are continuously being improved, and new manufacturing methods are continually emerging. Recently, a phase separation rinsing method (10) was reported. This involves smelting $Ge0_2$ and sodium silicoborate glass in a crucible. After injecting in oxygen, mixing and oxidation, the content is melted to become glass and pulled into rods. Finally, the rods are heated to above the softening temperature and then the rods are separated into two connected phases, i.e., the rice $Si0_2$, $Ge0_2$ phase and the ion phase. The ion phase contains most of the boron and sodium oxide. The latter can be rinsed and washed away by a type of acidic solution. This method is said to have a rapid rate of production, a large yield and a low cost. It has provided conditions for mass production.

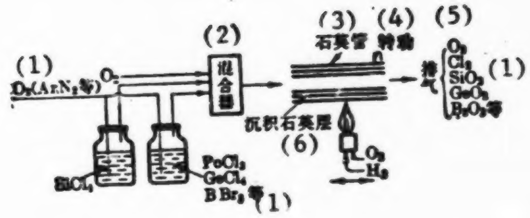


Diagram 1 Illustration of chemical gas phase sedimentation in a tube

1 etc.
2 Mixer
3 Quartz tube
4 Rotation
5 Exhaust gases
6 Settled quartz layer

Application of Inorganic Synthesis and Development of New Types of Optical Fiber Materials

Optical materials of long wavelength and extremely low loss are the hopes in the development of long distance, large capacity and no repeater communications. They also have broad foreseeable applications in energy conversion, transmission, infrared probing of space, as well as in medicine and image and data transmission. Therefore they are being researched with emphasis abroad.

To obtain optical materials of long wavelength and low loss, the materials and the operating wavelength must be selected as follows:

(1) The electron absorption peak of the material must fall within the shortwave zone while the oscillatory absorption within the infrared wave segment must also be very small, and the absorption peak of the oxyhydrogen radical must be avoided.

(2) The original scattering of the material must be very small.

(3) The incident wavelength should be selected near the intersecting point where the material absorption is zero.

(4) The absorption by impurities and defects must be extremely small at the wavelength used. If the wavelength is chosen within the infrared zone, the effects of absorption by water and by completely oxidized transient metallic ions is very weak.

(5) The fiber material must be able to form a stable vitreous body, and the material should possess an even light conduction property.

The source of loss due to absorption by the material is the ultraviolet absorption produced by electron migration in the material and infrared absorption produced by electron oscillation. Scattering by the material is related to the incident wavelength and refraction (11). The longer the incident wavelength, the smaller the oxidation value of anions of the material, the lower the conversion temperature of the material, the more beneficial to obtaining low loss properties.

For quartz and vitreous bodies, silicon dioxide optical fibers are being studied the most at present. This is because silicon dioxide is singular in composition, the raw material is easily extracted and low loss can be easily obtained. But the melting point of silicon dioxide is high. In synthesis and pulling fibers, the heat source, container and equipment are all limited and related problems are not easily solved. Relatively speaking, the melting point of glass fiber is much lower, the types of raw materials are mixed, the amounts for purification and refining are large and the opportunities for creating pollution are increased and it is difficult to obtain low loss optical fibers. If we start out by reducing the original absorption and original scattering of glass and select elements that have a large inertia against light absorption and that have an s, p type outer electron structure such as alkali metals and alkali earth metals, stable acidic earth elements such as subgroups of silicon and germanium and subgroups of boron and aluminum, and if we select their composition and proportions appropriately so that the components of glass are not too many and the melting point is relatively low and the substance can be melted into an even solid solution, we can obtain low loss optical fiber materials. Research has pointed out that the original absorption and original scattering of certain series of glass, such as sodium-aluminum-silicon series glass are smaller than those of quartz (4).

The loss due to absorption in glass with multiple components come mainly from impurities in the raw materials. If the impurities can be correspondingly lowered using purification and refining techniques, then multiple component glass can hopefully become good optical fiber materials.

The other type of optical fiber materials -- halides -- are being widely studied. Compared to the series of quartz and glass, halide materials are completely transparent within the range of the wider infrared range. The term of the oxidation value of the anions ($Z_a^2 = 1$) is smaller by fourfold than that of glass ($Z_a^2 = 4$). They also have an even lower conversion temperature, therefore halide materials can have an even smaller scattering than silicon dioxide glass. Actually, the original loss due to scattering is below 1 x 10^{-3} decibels/kilometer in BeF_2 at 1.05 µm, $ZnCl_2$ at 3.5 to 4.0 µm, and TlBr at 8 µm. The chromatic dispersion of silver halide within a very wide range of infrared waves is very small, optical loss is also very low, and within the range of these wavelengths, absorption caused by impurities of transient metals and OH^- is all very small. These characteristics have attracted people's attention to halide materials (12,13).

At present, research of new types of extremely low loss optical materials abroad include the series of halogen and alkali metal compounds, the series of compounds of halogen and thallium, silver, zinc, beryllium, as well as the series of compounds of silicon, germanium and sulfur, selenium. These compounds have a very small original loss in the material (within the range of 10^{-1} to 10^{-5} decibels/kilometer) with a range of 2 to 10 μm. Among the three types of compounds listed above, alkali metallic halides mostly belong to ion type crystals, their polarity is large, their conversion temperature is high, and they are not easily made into even vitreous bodies, therefore they are poor in their mechanical properties and optical evenness. But germanium-silicon compounds and sulfur-selenium-tellurium compounds easily vitrify, but the Z_a value is large, the covalence of the bond is strong, the conversion temperature is relatively high. Only the halides of thallium, silver, zinc and beryllium can satisfy the demands of long wavelength and extremely low loss optical materials in their crystalline structure, their bonding and polarity, their Z_a values, their conversion temperature. Actually, thallium bromide and thallium iodide fibers of a loss of 0.01 decibel/kilometer have been produced. Zinc chloride fibers and silver bromide fibers with a loss of 0.1 decibel/kilometer and 0.2 decibel/kilometer have also been produced.

Finally, to obtain optical materials of good properties, besides paying attention to the absorption by the material and loss due to scattering, attention must also be paid to the material's own property of forming vitreous bodies well so that workable materials with even optical properties can be obtained. These properties are all related to the components and the conditions of synthesis of the materials. The structure of the SiO_2 series glass is a connected tetrahedron. The structure of the B_2O_3, As_2S_3 series glass is a triangular arrangement. These structural types can be adjusted by the components of the alkali metallic halides to form stable vitreous structural characteristics. These still have to rely on more profound research in their chemical composition, structure and properties.

At present, research in new types of optical fiber materials is still not sufficient. Work in this regard in our nation is even less. The task of materials science is to utilize the basic theories of chemistry, physics, especially crystal chemistry, quantum chemistry and solid state physics to explore and study new types of materials. In such exploration and research, inorganic synthetic chemistry can provide important means in basic research and synthesis techniques. In the future, as optical communications technology develops, inorganic synthetic chemistry will develop greater functions in seeking new optical fiber materials and in studying new manufacturing techniques.

9296
CSO: 4008/394

BRIEFS

MINIATURE COMPUTER--Beijing, 18 Jun (XINHUA)--The "DJS140 miniature multi-purpose high-grade electronic computer," designed by Qinghua University and other units and trial-manufactured by the Beijing No 3 computer plant, was recently assessed by the state and deemed suitable for mass production and nationwide application. Composed of Chinese-made medium-sized and small integrated circuits, the computer can store 64-128K (1K stands for 1,000 bits of information) and perform 800,000 computations per second. It has an access time of 1.2 microseconds and 81 instructions of all kinds. Recently the State Computer Industry Bureau organized a group composed of the Beijing wired communication equipment plant, Qinghua University and eight other units to test three samples of this computer. The computers were found to have reached or surpassed the testing standard and technical requirements. [Beijing Xinhua Domestic Service in Chinese 0025 GMT 18 Jun 81]

GUANGDONG COMPUTER CENTER--The Nanhai branch of the China Petroleum Company has set up an electronic computer center using modern equipment in Guangdong's Zhanjiang Municipality. The equipment was imported from France. [Beijing Domestic Service in Mandarin 1200 GMT 28 Jul 81]

CSO: 4008/450

PUBLICATIONS

TABLE OF CONTENTS OF 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' NO 1, 1981

Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 1, 1981 on back cover

[Text] An Exploration of Biological Order......Huang Huici [7806 1920 1964], Biophysics Research Institute, Chinese Academy of Sciences (1)

The Structure and Function of Chlorophyll A (Chla)...... Mei Zhen'an [2734 6966 1344], Department of Biology, Beijing University (4)

The Molecular Mechanism of Steroid Hormone Action...... Yao Liansheng [1202 6647 3932], Shanghai Institute of Biochemistry, Chinese Academy of Sciences (11)

Biologically Active Peptides--Substance P. ......Wen Bogui [3306 0590 6311], Department of Biochemistry, Jiangxi Medical College (17)

The Formation of Three-dimensional Structure and Evolution of Protein......Wang Dacheng [3769 1129 2052], Biophysics Research Institute, Chinese Academy of Sciences (26)

Studies of Polynucleotide Synthesis. XII. Synthesis of CUCG and CCAp......Peng Bo [1756 3258], Wu Renlong [0702 0088 7893] and Gao Xiang [7559 5046], et al., all of the Biochemistry Research Institute, Chinese Academy of Sciences (32)

Preparation of Polyinosinic Acid-Polycytidylic Acid (Poly I:C) (I), (II)......Li Nanqian [2621 2809 5409], Li Youhua [2621 1635 5478] and Li Gaowo [7812 7559 3087], all of the Biophysics Research Institute, Chinese Academy of Sciences; et al. (35)

The Synthesis and Use of 4-N, N-Dimethylaminoazobenzene-4'-isothiocyanate as a New Reagent for Protein Sequence Determination......Yu Henian [0205 7729 1628] and Pan Jiaxiu [3382 1367 4423], both of the Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (41)

The Preparation of a Buffer Commonly Used in Biological Research--N-2-Hydroxyethyl-piperazine-N'-2-ethane Sulfonic Acid......Cui Haoji [1508 3185 0679] and Lu Yingen [4151 6892 2704], both of the Biochemistry Research Institute, Chinese Academy of Sciences (44)

Determination of Human Serum Lactate Dehydrogenase Isoenzymes......Wang Jinshou [3769 6855 1108], Huangshi Mining Bureau Hospital, Hubei (46)

Preparation of Plasmic Membrane Vesicles from Rat Peritoneal Macrophages by Tissue Culture......Zhen Qingyi [2582 1987 6965], Ji Ruihua [1323 3843 5478] and Hu Shizhen [5170 0013 4176], all of the Oncology Group, Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (48)

Studies on the Mitochondrial Biogenesis of Haploid and Diploid Cells of *Saccharomyces cerevisiae*. I. Changes of Enzymatic Activities in Mitochondrial Inner Membrane from Glucose Repression to Derepression and the Effect of Chloramphenicol during Glucose Derepression......Lin Zhihuan [2651 3112 3562], Li Jinzhao [2621 6855 3564] and Zhao Yunjuan [6392 0061 7710], et al., all of the Biophysics Research Institute, Chinese Academy of Sciences (50)

The Separation of Labeled Bound Antigen and Labeled Free Antigen by Polyethylene Glycol......Deng Shouzhen [6772 1343 4176], He Wanting [0149 1238 1250] and Lin Xiangdong [2651 4382 6639], all of the Huashan Hospital Isotope Group, Shanghai First Medical College (54)

Studies on the Crystallization Condition and Crystal Growth of Nitrogenase Mo-Fe Protein from *Azotobacter vinelandii* ......Li Jiage [2621 0163 2706], Xu Ji [1776 4949], Gu Tianqing [7357 1131 7230] and Jing Yuxiang [5427 3768 4382], all of the Institute of Botany, Chinese Academy of Sciences; Liu Defu [0491 1795 1381], Zhao Wen [6392 2429] and Dong Bei [5516 0554], all of the Biophysics Research Institute, Chinese Academy of Sciences (55)

Studies on the *In Vitro* Transfer of Cell-mediated Immunity with Allogeneic Anti-S180 "Immune" RNA......Hong Changfu [3163 7022 4395], Yu Hui [0205 1979], both of the Zhejiang People's Health and Testing Hospital; Ding Renrui [0002 0088 3843], Zhang Tongwen [1728 4827 2429] and Zha Shijun [2686 1102 7165], all of the Department of Biology, Hangzhou University (58)

Determination of Protein Crystal Structure Series Programs No 2--Calculation of the Phase Using Probability Method......Song Shiying [1345 2514 5391] and Li Jun [2621 6511], both of the Biophysics Research Institute, Chinese Academy of Sciences (61)

Technique in Computerized Spectral Analysis of Body Surface Potential......Liu Chengde [0491 2110 1795], Chen Hongjun [7115 7703 6874], Zhu Qingfu [2612 1987 1381] and Tao Baoshan [7118 1405 1472], all of the Anhui College of Chinese Traditional Medicine (64)

The Superweak Luminescence at the Interface between Aqueous Protein Solutions and Lipids......Li Qingguo [2621 1987 0948] and Weng Yumin [5040 3254 3046], both of Fudan University (66)

The Effects of Physico-chemical Factors on the Intensity of Luminescence of *Photobacterium phosphoreum* A_2......Yang Yikang [2799 7328 1660], Ye Luping [5509 1462 1627] and Hu Tianxi [5170 1131 0823], all of the Shanghai Teachers' University (69)

Determination of Amylose, Amplopectin and Starch of Grain by Two-wavelength Spectrophotometer......He Zhaohua [0149 3564 5363], Guizhou Agricultural College (70)

Study on Amino Acid Incorporation Directed by Guinea Pig Liver mRNA in a Cell-free System Derived from Wheat Germ ......Jing Guozhong [7234 0948 1813], Chen Jianwen [7115 1696 2429], Chen Yan [7115 3601] and Li Yuezhen [2621 6460 6297], all of the Biophysics Research Institute, Chinese Academy of Sciences (72)

Modification of the Lubricating System of Model VAC-60 Ultracentrifuge......Zhang Weiming [1728 4850 2494], Xing Chunlin [6717 2504 2651] and Wang Bin [3769 2430], all of the Xinjiang Chemistry Research Institute, Chinese Academy of Sciences (75)

9717
CSO: 4008/373

PUBLICATIONS

TABLE OF CONTENTS OF 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' NO 2, 1981

Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 2, 1981 on back cover

[Text] Trends in Molecular Biology......Zou Chenglu [6760 2110 7627], Biophysics Research Institute, Chinese Academy of Sciences (1)

Chiral Dynamics of Biomolecules......Xu Jinghua [1776 0079 5478], Shanghai Biochemistry Research Institute and the Biophysics Research Institute, Chinese Academy of Sciences (11)

NMR and Its Applications in Molecular Biology......Hua Qingxin [5478 1987 2450], Biophysics Research Institute, Chinese Academy of Sciences (15)

Reactive Oxygen and Its Biological Significance......Mo Jian [5459 4675], Department of Chemistry, Fourth Military Medical University (23)

Freeze-fracturing and Freeze-etching Technique......Lu Qiwu [7627 1505 0767], Wu Yuwei [0702 3768 5633] and Fu Guangli [0265 1639 4409], all of the Biophysics Research Institute, Chinese Academy of Sciences (29)

The Polymerization of $G>p$ Catalyzed by Ribonuclease N_1 at Higher Temperature......Zou Biyan [6760 4310 3601] and Chen Changqing [7115 1603 1987], both of the Shanghai Institute of Biochemistry, Chinese Academy of Sciences (35)

Two Alkaline Phosphatases from Swine Kidney......Fei Ruzhen [6316 1172 3791], Nanjing College of Chinese Traditional Medicine; Xu Fen [1776 2001], Nanjing Medical College (38)

Studies on the Cold Sensitivity of Mitochondrial Soluble ATPase from Pig Heart......Zhao Yunjuan [6392 0061 7710] and Zhang Shuxiu [1728 3219 4423], both of the Biophysics Research Institute, Chinese Academy of Sciences (41)

Studies on Mitochondrial Biogenesis of Haploid and Diploid Cells of *Saccharomyces cerevisiae* (II)......Chen Shouyi [7115 0649 1355], Huang Youguo [7806 2589 0948], Xing Jingru [6717 5464 1172], et al., all of the Biophysics Research Institute, Chinese Academy of Sciences (44)

A Micromethod for Determining the Synaptosomal (Na, K)-ATPase Activity in Rat Brain......Feng Beiyuan [7458 0554 0337] and Xu Muyu [1776 1970 4416], both of the Endocrinology Laboratory, Institute of Zoology, Chinese Academy of Sciences (48)

Preparation of Lactoperoxidase and Enzymic Method for the Trace Iodination of Porcine Thymic Hormone......Jin Yifeng [6855 0110 6265], Tang Guozhi [3282 0948 2655] and Xu Xianxiu [1776 6343 4423], all of the Molecular Biology Research Group, Department of Biology, Nanjing University (50)

Introduction of a Simple Solid-phase Protein Sequencer...... Xu Zuojie [1776 0146 2638] and Qi Zhengwu [2058 2973 2976], both of the Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (52)

A Rapid and Stable Radioimmunoassay Reagent: Antibody Coated Protein A Containing *Staphylococcus aureus*......Chen Yixin [7115 0001 2450], Cao Hegan [2580 0735 6373], Mei Zhishou [2734 1807 1108] and Li Ping [2621 5493], all of the Jiangxi Industrial Health Research Institute; Shen Senju [3088 2773 1444], Meng Fuzhen [1322 4395 3791] and Wang Xiaodan [3769 1420 0030], all of the Jiangxi Medical Sciences Research Institute (55)

Preparation of Fluorescein-labeled Concanevalin A......Zhu Zhengmei [2612 2973 5019] and Gu Tianjue [7357 1131 3635], both of the Department of Biochemistry, Shanghai First Medical College (58)

Water Elimination Experimental Technique for NMR......Zhang Shuizhen [1728 3055 3791], Biophysics Research Institute, Chinese Academy of Sciences (59)

Potassium Ferrioxalate Actinometer and Its Applications in Flash Photolysis......Zhang Yin [1728 5419], Tang Dejiang [0781 1795 3068] and Chen Chunzhang [7115 2504 4545], all of the Biophysics Research Institute, Chinese Academy of Sciences (62)

Flash Spectrophotometer for Studying Photosynthesis...... Sun Binrong [1327 3521 2837], Testing and Computation Center, Shanghai Branch of the Chinese Academy of Sciences; Liu Yixian [0491 0001 0341], Department of Physics, Fudan University (65)

A Simplified Method for Preparation of Aminopeptidase-M ......Yu Henian [0205 7729 1628], Gu Hanying [7357 3211 5391] and Luo Chaoquan [5012 6389 2938], all of the Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (68)

Investigation of Ethyl Mercuric Chloride Derivation of Insulin at 1.5 Å Resolution......Zhao Baoguang [6392 1405 0342] and Bi Ruchang [3968 3067 2490], both of the Biophysics Research Institute, Chinese Academy of Sciences (70)

Measurement of Lateral Diffusion of Rhodopsin in the Disk Membrane of a Frog......Hu Kunsheng [5170 0981 3932], Ma Wanlu [7456 8001 4389] and Tan Manqi [6151 2581 3825], all of the Biophysics Research Institute, Chinese Academy of Sciences; Zhao Dongpo [6392 2639 0980], Shandong Institute of Chinese Traditional Medicines (72)

The Enhanced Effect of the Dye-eosin on Light-induced Protein Chemiluminescence......Weng Yumin [5040 3254 3046], Li Qingguo [2621 1987 0948] and Wang Kehua [3769 0344 5478], all of Fudan University (74)

DNA Changes in the Hemopoietic Tissues of Animals after Irradiation......Zheng Xiulong [6774 4423 7893], Wu Delin [0702 1795 2651], Liu Qiaonian [0491 1564 1628] and Zhao Fang [6392 5364], all of the Second Military Medical University (77)

9717
CSO: 4008/365

PUBLICATIONS

TABLE OF CONTENTS OF 'XINLI XUEBAO' NO 2, 1981

Luda XINLI XUEBAO [ACTA PSYCHOLOGICA SINICA] in Chinese No 2, 1981 inside back cover

[Text] Articles

The Current Developmental Psychology in China with Particular Reference to the Development of Number-concepts of 3-12 Year Old Chinese Children......Liu Fan [0491 5400], Institute of Psychology, Chinese Academy of Sciences (117)

Sport Psychology Thought in Ancient China......Chai Wenxiu [2693 2429 4918], Tianjin College of Physical Culture (124)

Some Problems in the Classification of Psychological Study Methods......Wang Shumao [3769 2885 5399], Institute of Philosophy, Academy of Social Sciences, Liaoning (129)

Research Papers

A Study on the Development of Number Concepts and Operational Abilities of 7-12 Year Olds in 10 Districts in China ......Liu Fan [0491 5400], Lu Jing [0712 7234], et al. (135)

A Study of the Individual Case of a Child in Mastering the Number Concept--A Follow-up Study of a Child at the Age of 3-4 Years Old (I)......Xu Zhiquan [6079 2535 2938] and Song Baoling [1345 1405 3781], both of Zhengzhou University (150)

Experimental Study on the Development of Children's Cognition of the Relations between Parts and Whole (II)--Combination and Decomposition of Numbers in Children of 4-7 Years Old......Lin Jiasui [2651 0857 4840], Institute of Psychology, Chinese Academy of Sciences (159)

Time Recognition in Human Activities......Paul Fraisse (168)

Further Data on the Uniformity of the CIE 1960 UCS Diagram ......Yu Bolin [0827 2672 2651], Jiao Shulan [3542 2579 5695] and Jing Qicheng [5427 0366 6134], et al., all of the Institute of Psychology, Chinese Academy of Sciences (177)

A Serial Study on the Relative Spectral Luminosity among Chinese People (IV)--Influence of the Luminance Levels on the Relative Spectral Luminosity......Ma Mouchao [7456 6206 6389], He Baoyuan [6378 5508 3293] and Ji Guiping [4764 2710 5493], et al., all of the Institute of Psychology, Chinese Academy of Sciences (186)

Effects of Hypoxia on Brain Functions and Mental Performances in High Mountains......Lin Zhongxian [2651 0112 6343], Ma Mouchao [7456 6206 6389], Hong Shengqin [3163 3932 0530], et al., all of the Institute of Psychology, Chinese Academy of Sciences; Xu Bingheng [1776 4426 1854] and Lu Jingen [7120 6930 2704], both of the Shanghai Institute of Physiology, Chinese Academy of Sciences (192)

3D-TV (Model PLZT) and Operation of Manipulator......Yu Jisheng [5713 4480 3932], Gao Jing [7559 2533] and Fang Liluo [2455 0196 3157], et al., all of the Institute of Psychology, Chinese Academy of Sciences (201)

Display Area of Sinusoidal Gratings and Low Spatial Frequency Channels......Yu Wenzhao [0205 2429 6856], Shanghai Institute of Physiology, Chinese Academy of Sciences (207)

Effect of REM Deprivation on Consolidation of Memory in Rats......Li Deming [2621 1795 2494] and Shao Daosheng [6730 6670 3932], both of the Institute of Psychology, Chinese Academy of Sciences (226)

Coordinate Activities of the Two Cerebral Hemispheres: Observation of Higher Psychological Function during 14 Years after a Right Hemisphectomy......Li Xintian [2621 1800 1131], Hu Chaoqun [5170 6389 5028] and Guo Nianfeng [6753 1819 6912], all of the Institute of Psychology, Chinese Academy of Sciences; Wang Sun [3769 1327], et al., all of the Department of Neurology, Kunming Medical College (217)

Psychology Abroad

Psychology in Japan......Sun Ye (212)

Some Developments of the Neurobiological Study on Learning and Memory......Xu Bingheng [1776 4426 1854], Shanghai Institute of Physiology, Chinese Academy of Sciences (233)

Views and Events in Science

Strengthening Logical Analyses is Helpful in Improving Psychological Experiments...... (241)

A Delegation of American Psychologists Vists China...... (243)

The First Annual Conference of the CPA Division of General and Experimental Psychology...... (246)

Annual Academic Conference of Medical Psychology Yields Successful Results in Many Respects...... (247)

A Brief Introduction to the Inaugural Meeting of the CPA Division of Physiological Psychology and Its Academic Activities...... (248)

9717
CSO: 4008/384

PUBLICATIONS

TABLE OF CONTENTS OF 'ZHONGHUA SHENJING JINGSHENKE ZAZHI' NO 2, 1981

Beijing ZHONGHUA SHENJING JINGSHENKE ZAZHI [CHINESE JOURNAL OF NEUROLOGY AND PSYCHIATRY] in Chinese No 2, 1981 inside back cover

[Text] Contents in Brief

Overinclusive Thinking in Schizophrenia......Fan Zuoshu [2868 0155 2885] and Qu Ying [1448 5391], both of the Beijing Anding Hospital; Chen Zhongkang [7115 0112 1660] and Zhang Boyuan [1728 0130 3293], both of the Department of Psychology, Beijing University (65)

Treatment of Depression with Domestic Amytriptyline...... Zhou Tianxing [0719 1131 7490], Zhang Mingyuan [1728 2494 0337] and Xia Zhenyi [1115 6966 1138], all of the Shanghai Psychiatric Hospital (68)

Symptoms of Primary Importance in the Diagnosis of Schizophrenia......Zhang Mingyuan [1728 2494 0954] and Zhang Lei [1728 4320], both of the Shanghai Psychiatric Hospital; Wang Zuxin [3769 4371 6082], Han Shuihua [7281 3055 5478] and Liu Jiancheng [0491 1696 2052], et al., all of the Beijing Medical College (72)

Factors Influencing the Prognosis of Schizophrenia in Adolescents and Children--A Report of 118 Cases......Yu Hongjun [0060 4767 6511], Yanbian Psychiatric Hospital, Jilin (76)

Follow-up Study on the Ischemic Cerebrovascular Diseases Treated with Extracranial-intracranial Arterial Anastomosis ......Zang Renhe [5258 0086 0735] and Liu Wenyao [0491 2429 5069], both of the Department of Neurology, First Affiliated Hospital, Xinjiang Medical College (79)

Clinical and Roentgenological Study of Microsurgical Operations for Treating Occlusion of Middle Cerebral Artery...... Guo Qinglin [6753 1987 2651], Huang Qiliu [7806 0366 9497] and Yi Shengyu [2496 5116 4416], all of the First Affiliated Hospital, Fourth Military Medical University (83)

Extracranial-intracranial Arterial Anastomosis in the Treatment of Cerebral Ischemic Diseases......Zhang Cheng [1728 2052], Department of Neurology, Shandong Medical College Affiliated Hospital; Zhang Shuchen [1728 0647 6591], Department of Neurology, Hospital No 90, PLA; Li Jianghan [2621 3068 3352], Department of Surgery, Hospital No 89, PLA; et al. (86)

Anastomosis of the Superficial Temporal Artery and Middle Cerebral Artery in Treating Ischemic Cerebrovascular Diseases --Report of 60 Cases......Ren Wende [0117 2429 1795] and Sun Ningjia [1327 0413 1367], both of the Department of Neurosurgery, Shandong People's Hospital (90)

Microsurgical Operation in the Treatment of Occlusive Cerebrovascular Diseases of the Carotid Arterial System......Yi Shengyu [2496 5116 4416], Chen Changcai [7115 7022 2088] and Wu Baoren [0702 0202 0088], et al., all of the First Affiliated Hospital, Fourth Military Medical University (94)

Clinical Analysis of 17 Cases of Cerebral Echinococcosis ......Shi Xingtan [0670 2502 0982], Department of Neurosurgery, Qinghai Medical College Affiliated Hospital; Wang Shihe [3769 0013 0735] and Sun Wenchang [1327 2429 2490], both of the Department of Surgery, Qinghai People's Hospital; Zhu Guoling [2612 0948 3781] and Song Jiaren [1345 1367 0088], both of the Department of Surgery, Ningxia Medical College Affiliated Hospital (98)

Review of Chinese Literature on Multiple Sclerosis and Demyelinization Cerebral Diseases......Zhao Baoxun [6392 5508 3169], Department of Neurology, Capital Hospital, Chinese Academy of Medical Sciences (101)

Clinical Features of Multiple Sclerosis--Clinical Analysis of 141 Cases......Xu Jie [1776 3381], Xiao Zhenxiang [5135 6966 4382], both of the Department of Neurology and Internal Medicine, Xuanwu Affiliated Hospital, Beijing Second Medical College; Hu Weiming [5170 4850 6900] and Ge Maozhen [5504 5399 2182], both of the Department of Neurology, Harbin University of Medical Sciences; Wang Wenyu [3769 2429 0151], Tian Jingxian [3944 2529 0341] and Wang Liqun [3769 7787 5028], all of the Department of Microbiology, Harbin University of Medical Sciences (105)

Disorders of Body Image in Multiple Sclerosis Patients--Report of Four Cases......Li Danian [2621 1129 1628], Department of Neurology, Shandong Medical College Affiliated Hospital (109)

Clinicopathological Study on a Case of Multiple Sclerosis ......Luo Deru [5012 1795 0320], Neuropathology Teaching and Research Group, Sichuan Medical College; Wang Bingkang [3076 4426 1660], Pathology Teaching and Research Group, Sichuan Medical College (112)

Encephalitis Periaxialis Concentrica (Balo's Disease)--Report of a Case......Zhou Mingjing [0719 6900 6975], Pathology and Dissection Teaching and Research Group, Third Military Medical University, PLA (114)

Tuberous Sclerosis--Report of Five Cases......Xu Yufu [5171 3768 4811], Hospital 242, Shenyang (117)

Tuberous Sclerosis Associated with Astrocytoma--Report of a Case Studied by Postmortem Examination......Chen Xiaoyi [7115 1420 3015], Pathology and Dissection Teaching and Research Group, Zhanjiang Medical College (119)

Ultrasonic Diagnosis for Cerebral Hydatid Cyst--Analysis of 18 Cases......Liu Dafu [0491 6671 1133], Xu Limin [1776 4539 2404] and Guo Huairong [6753 2037 2837], et al., all of the First Affiliated Hospital, Xinjiang Medical College (121)

9717
CSO: 4008/383

TABLE OF CONTENTS OF 'GAONENG WULI YU HE WULI' NO 3, 1981

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 5 No 3, 1981 inside back cover

[Text] The Spectral Representation of Propagator for Fermion Field and Quark Confinement......Gao Chongshou [7559 1504 1108], Beijing University; Ruan Tunan [7086 0956 0589], University of Science and Technology of China (281)

The Double Spectral Functions of Photon-Nucleon Scattering and Inelastic Cross Sections of $\gamma + p \rightarrow p + \pi^+ + \pi^-$...... Song Xiaotong [1345 1321 0681] and Wang Minchang [3769 3046 2490], both of Hangzhou University (291)

Alpha-alpha Elementary Amplitude and High Energy Nuclei-nuclei Collision......Liu Yuan [0491 3220], Li Yangguo [2621 2254 0948] and Wang Rulin [3769 1172 3829], all of the Institute of High Energy Physics, Chinese Academy of Sciences (297)

Discussion of a SU(2) x U(1) x S_3 Model with Two Higgs Doublets and Calculation of Cabibbo-like Parameters...... Ma Zhongqi [7456 0022 7496], Dong Fangxiao [2639 2455 2556] and Yue Zongwu [1471 1350 0063], et al., all of the Institute of High Energy Physics, Chinese Academy of Sciences (306)

The Problem of Four Generation Straton Weak Coupling Matrix ......Li Tiezhong [2621 6993 1813], Institute of High Energy Physics, Chinese Academy of Sciences (313)

Partial Restoration of the Chiral Symmetry and the π Condensation in Nuclear Matter......Zhang Qiren [1728 0796 0088], Beijing University (320)

Analysis of Quasi-Δ_{33} Doorway State Model in π Nucleus Scattering......Gao Qin [7559 3830], Hangzhou University; Zhang Zongye [1728 1350 8768] and Ma Weixing [7456 4850 5281], both of the Institute of High Energy Physics, Chinese Academy of Sciences (327)

The Beam Envelop Analysis for Non-periodic Systems...... Wei Kaiyu [7614 7030 3558], Institute of High Energy Physics, Chinese Academy of Sciences (333)

Single K Meson and $2\pi, \pi\rho$ Exchanges in the -N Interaction ......Wu Huifang [0702 1979 5364], Shen Jianping [3088 1696 1627], Yu Youwen [0151 0645 2429] and Zhang Zongye [1728 1350 8768], all of the Institute of High Energy Physics, Chinese Academy of Sciences (338)

A Survey of Some Ideas for Accelerators Using Laser Light ......J. D. Lawson, Rutherford Laboratory, Chilton, Oxon, England (345)

Microscopic Calculation of Viscosity Coefficient in Heavy Nuclei......Feng Renfa [7458 0088 4099], Wu Xizhen [0702 6932 4176], Zhang Xizhen [1728 6932 3791] and Zhuo Yizhong [0587 4135 1813], all of the Institute of High Energy Physics, Chinese Academy of Sciences (351)

The Antisymmetric Effect of Nucleon and Quark in Scattering Process......Wang Fan [3769 0416], Nanjing University; He Yin [0735 7299], Institute of Atomic Energy, Chinese Academy of Sciences (357)

The Generator Coordinate Method and Nuclear Collective Motions (IV) TDGCM Versus ATDHF......Xu Gongou [1776 6501 5096], Lanzhou University (363)

Quasi-elastic and Deep Inelastic Reactions of ^{12}C on ^{27}Al ......Wu Zhongli [0702 6945 4539], Zhu Yongtai [6175 3057 3141] and Xia Guozhong [1115 0948 0022], et al., all of the Institute of Modern Physics, Chinese Academy of Sciences (371)

Research Notes

The G_S Parity of Strange Mesons and the Selection Rule in Strong Decay of Resonance State......Li Ziping [2621 1311 1627], Xinjiang University (373)

Investigation of the Effect of Nuclear Short Range Correlation in Heavy Ion Scattering......Lu Shiqi [4151 0013 3825], Wang Rulin [3769 1172 3829] and Ma Weixing [7456 4850 [illegible]281], all of the Institute of High Energy Physics, Chinese Academy of Sciences (377)

Generating Functional and Structure of a Vacuum......Wang Kelin [3076 0344 2651], University of Science and Technology of China (380)

Distribution of Two-dimensional Field of Permanent Magnetic Plane Head Quadrupole and Its Geometric Parameter Selection ......Liu Maosan [0491 5399 0005], Wu Wentai [0702 2429 3141], Li Shuzhen [2621 3219 3791] and Chen Renhuai [7115 0088 2037], all of the Institute of High Energy Physics, Chinese Academy of Sciences (385)

The Multiband Mixing and the i(ω)......Gu Jinnan [7357 6855 0589], Institute of Modern Physics, Chinese Academy of Sciences (389)

PNC Method for Treating the Pairing Correlation in Spherical Nucleus......Zhang Mei [1728 3780] and Xue Yuyi [5641 4416 2496], both of Qinghua University; Zeng Jinyan [2582 6210 6056], Beijing University (392)

9717
CSO: 4008/368

TABLE OF CONTENTS OF 'HUAXUE TONGBAO' NO 5, 1981

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 5, 1981 on back cover

[Text] Template Polymerization--A New Polymerization Method......Li Zhifen [2621 1013 5358], Wang Shenguo [3769 6500 0948] and Xi Fu [5045 1788], all of the Institute of Chemistry, Chinese Academy of Sciences (1)

Linear Free Energy Relationships in Coordination Chemistry ......Chen Rongti [7115 2837 1879], Department of Chemistry, Nankai University (5)

Studies of Extraction of Cobalt (II) and Magnesium with Di-(2-Ethylhexyl) Phosphoric Acid in Sulfate System...... Liu Dexin [0491 1795 0207], Zhan Shoutang [1455 1343 1016], Meng Zhaodong [1322 2507 2767] and Feng Xusheng [7458 4872 0524], all of the Department of Chemistry, Shandong University (10)

Color Reaction of Molybdoantimonophosphoric Heteropoly Acid with Basic Dyes in Aqueous Solution......Liu Shaopu [0491 4801 3877], Hongqi Diesel Engine Plant, Sichuan (11)

Thin Layer Microanalysis by Laser Fusion-polarography...... Chen Lanzhen [7115 5695 4394; deceased], Wang Mengxia [3769 1125 7209] and Yang Yunfa [2799 6663 4099], all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (12)

The Synthesis of Poly-di-n-Butyl-Cinnamylidenyl Malonate and Its Light-etching Properties......Huang Jianxing [7806 1696 5281], Zhao Shuzhen [6392 3219 3791] and Yu Xianhui [0151 7359 2547], all of the Department of Chemistry, Huanan Teachers' College (14)

Multinuclear Magnetic Non-equivalence Use of Chiral Reagents ......M. L. Martin (16)

The Solubility Regularity of Inorganic Salts in Water...... Zhou Zhihua [0719 1807 5478], Department of Chemistry, Nanjing Teacher's College; Wen Yuankai [3306 0337 0418], University of Science and Technology of China (17)

Ultramicro Determination of Beryllium in Surface Water and Urine by Gas Chromatography......Cai Qixiu [5591 6386 4423], Xie Jifa [6200 4949 4099] and Ma Hengli [7456 1854 0536], all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences; Yang Mingliang [2799 2494 0081] and Huang Guorong [7806 0948 2837], both of the Shanghai Smeltery No 2 (21)

Simple Equipment for pH and Electric Potential Recording ......Dong Shannian [5516 0810 1628], Analytical Chemistry Teaching and Research Group, Beijing Medical College (24)

Determination of the Surface Hydroxyl Group on Particulate Oxide......Xu Dongpeng [1776 2639 7720], Xia Yongxia [1115 3057 0204] and Li Yufu [2621 3768 4395], all of the Institute of Chemistry, Chinese Academy of Sciences (25)

The Rotating Ring-disk Electrode and Its Applications...... Gu Linying [6253 2651 9487], Electrochemistry Teaching and Research Group, Tianjin University (27)

Computer Assisted Organic Synthesis......Zhu Siyu [2612 1835 0205] and Zhang Jinpei [1728 6855 8951], both of the Elementary Organic Chemistry Research Institute, Nankai University (34)

Liquid Membrane--Recent Development of Membrane Technique ......Zhang Ruihua [1728 3843 5478], Department of Chemistry, Jiangxi Teachers' College (39)

Progress in Chemistry of Rare Gases......Feng Guangxi [7458 0342 3356] and Huang Xiangyu [7806 4382 3768], both of the Department of Chemistry, Chengdu University of Science and Technology (46)

Advances in the Studies of Formose......Jiang Tingda [5591 2185 1129] and Wu Changxian [0702 2490 6343], both of the Environmental Chemistry Research Institute, Chinese Academy of Sciences (51)

The Various Representations of Atomic Orbitals......Zhang Changyan [1728 2490 6056] and Yu Gengsun [0151 1649 5549], both of the Department of Chemistry, Gansu Teachers' University (55)

Angular Distribution Diagrams of f Atomic Orbit Applied to Different Situations......Xiong Huiling [3574 1979 7881], Department of Chemistry, Zhongnan Mining and Metallurgy College (59)

Why Is Alkalinity Not Exhibited at the Anode When a Solution of Potassium Chloride is Electrolyzed?......Wang Yidong, Zhu Haiyan and Chu Deying (63)

9717
CSO: 4008/388

AUTHOR: YU Shaoyong [0060 4801 1661]
CHEN Daoqi [7115 6670 3823]

ORG: Both of North China Center of Computer Science

TITLE: "Design, Research, and Making a PROM [Programmable Read-Only Memory] Programmer"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 6, Jun 81 pp 17-21

ABSTRACT: With the rapid development of LSI [large-scale integrated circuit] and microprocessors, applications of PROM, EPROM semiconductors are becoming very extensive while a PROM programmer becomes a necessary tool and at the same time it is also a component of the MDS system of miniature computers. This special use programmer is simply constructed and is generally to be used to program the PROM products of the same factory. There are also general purpose programmers on the market, manufactured by companies of the USA and Japan, however. Many types of such bipolar products were applied in the design of computers of the DJS-200 series and DJS-180 series, and the MOS type EPROM. There is, therefore, an urgent need to design a group of PROM programmers suitable for mass production. Taking into consideration the properties of various foreign make programmers and the special needs of China, the authors designed a general purpose one suitable for several major Chinese PROM, and MOS type EPROM products. The system structure, the function, the programming signal source, the CRT display, etc. of the programmer are explained.

AUTHOR: PANSHENG Qing [2104 3932 3237; transliteration of Japanese name] et al

ORG: None

TITLE: "Precision Needle-Type Han Character Typewriter"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 6, Jun 81 pp 42-54

ABSTRACT: In order that a Han character typewriter can be suitable for use as a computer terminal, it must be of small volume, light weight, low cost, and low noise. It must also be fast, produce a good quality print, have repeat writing capability, and the capability of making drawings and tables. The paper describes the method of designing such a typewriter and the structure of its final design, including some outstanding problems. This paper is an excerpted translation from REPORT OF PRACTICAL RESEARCH [a Japanese Journal] Vol 28 No 2, 1979.

6168
CSO: 4009/417

AUTHOR: GUO Xiaoning [6751 2556 1337]

ORG: Wuhan Boiler Plant

TITLE: "Analysis of Design of Scraper Type Slag Remover for the 300MW Boiler in Yuanbaoshan Thermal Power Plant"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 pp 13-17

ABSTRACT: In China, most thermal power plants use inferior coals of high ash residue and slag removal becomes one of the difficult problems. The major difficulty is the fact that the slag remover wears out quickly through abrasion and the parts have to be very frequently replaced. This is true with most hammer type, double roller type slag crushers. The 300MW boiler of Yuanbaoshan Thermal Power Plant is an import from France. In its 3 years of operation, the scraper type slag remover has been operating very well, unlike the others that have to be repaired every 3 to 6 months. There were a few accidents, but analyses revealed that they are completely avoidable with careful maintenance. This paper introduces the structure of the major portion of the French-make scraper which comes with the boiler. The slag-removing capacity of the scraper, the tractive force of the chain, and the strength of the major parts are analyzed and reported. There is also a description of the major merits of this machine.

AUTHOR: ZHU Longjiu [2612 7127 3773]
NI Jiucheng [0242 0036 2052]

ORG: Both of Beijing Electric Power Designing Academy

TITLE: "Emergency Auxiliary Power Supply for Large TG Units"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 pp 37-42

ABSTRACT: The safety and reliability of the power used in a thermal power plant are extremely important. Aside from guaranteeing the power source for starting the auxiliary equipment, there must also be power to guarantee safe stopping of the power-generating equipment of the plant. The AC emergency power sources available include the inverting battery, the diesel generator, or the gas turbine generator. At present, the tendency is to use the diesel generated emergency power. The representative designs of emergency power systems at Tuhe, Yuanbaoshan, and Dagang thermal power plants are introduced. The paper also includes a formula for designing the emergency power supply for a 200MW plant.

AUTHOR: None

ORG: None

TITLE: "First Joint Meeting of North China United Electrical Power Equipment Manufacturing Company and Its Technical Advisory Committee"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 7, 5 Jul 81 p 80

ABSTRACT: Under the guidance of the policy of developing advantageous conditions, protecting competition, and promoting cooperation of the central party and the State Council, the major electrical power equipment manufacturers of North China, on a voluntary basis, merged into the North China Electrical Power Equipment Manufacturing Joint Company in Oct 80. The constituent members of the company now include the Beijing Boiler Plant, Beijing Heavy Electrical Machinery Plant, the Tianjin Power Generating Equipment Plant, the Beijing Switch Plant, the Baoding Transformer Plant, the Beijing Low Voltage Electrical Device Plant, Tianjin Electrical Cable Plant, Tangshan High Voltage Electrical Ceramics Plant, Guilin Electrical Capacitor Plant, Guangzhou High Voltage Electrical Apparatus Plant, with 3 cooperative members of First Ministry of Machines Designing Academy, Nanjing Electrical Ceramics Plant, and the Zhengzhou Research Institute of Machines of the First Ministry of Machines Scientific Research Academy. That company will have 26,000 employees, of which 1,860 are technicians, 710 engineers. According to the 1979 data, the total production is valued at 4.3×10^8 yuan and the profit is 1×10^8 yuan. The first Technical Ad-

[continuation of DIANLI JISHU No 7, 81 p 80]

visory Committee meeting was held in Beijing on 1-4 Jun 80, and 86 members of the committee participated. Problems regarding operation decision making, types and quality of products, scientific research and service, technical cooperation, etc. were discussed. The request of the Neimenggu Bureau of Electrical Power Management for the company to take over the supply of power generating equipment, power transformers, power storage plants, phase modulation equipment, and the reconstruction of heating engineering of cities was also discussed. Contracts for technical cooperation were also signed with Beijing Steel and Iron Designing Research Academy, Ministry of Water Conservancy Beijing Surveying and Prospecting Design Academy, Henan Provincial Electric Power Science Experiment Institute, and Heilongjiang Provincial Forestry Designing Academy, etc.

6168
CSO: 4009/409

AUTHOR: MA Yunjie [7456 0061 2638]

ORG: None

TITLE: "Soft Printed Circuit Board"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 6, 81 p 32

ABSTRACT: The Shanghai Radio Plant No 20 is the first to succeed in making a soft printed circuit board. It has been certified for production in batches. Internationally, the soft printed circuit board is a new technology created and applied since the 60's. This technology remained a blank in China until now, however. It is small and light and can be folded and bent without affecting its reliability; therefore, it may be extensively used in cameras, telecommunication equipment, automobile instruments, precision meters, electronic computers, etc. The technique of making it is very briefly introduced.

AUTHOR: LYU Guofu [0712 0948 1381]

ORG: Shanghai Optical Machinery Institute

TITLE: "Introducing Digital Programmed Instrument for Controlling the Temperature of Epitaxial Furnace of Semiconductors"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 6, 81 pp 44-45

ABSTRACT: The epitaxial technique of growing multiple layer liquid phase semiconductors is currently an important means of preparing various functional parts in integrated optical research, and there is the problem of controlling the thickness of the epitaxial layer. It is known from theoretical computation that the thickness is in direct proportion to the speed of the temperature reduction. For this reason, the temperature is in need of precise control during the entire growing process, and the control involves a procedure of rising temperature-- constant temperature-- continuous reduction of temperature at a different rate of reduction. This paper introduces an instrument [made by the Shanghai Optical Machinery Institute?] designed for this purpose. It may also be used for temperature control in growing various crystals, annealing and heat treatment of crystals and glass, etc. The technical indices and the work theory of the instrument are given.

6168
CSO: 4009/431

Medical Experiments

AUTHOR: WANG Shu [3769 2579]
XIANG Xiue [7309 4423 1230]
LIU Qianxin [0491 3383 1800]

ORG: All of Second Military University of Medicine First Hospital

TITLE: "Pathomorphology and Phosphorus Determination of Phosphorus Burns in Rabbits"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 pp 136-138

ABSTRACT: In case of phosphorus burns, through either inhalation or the burnt surface absorption, phosphorus and its oxides may enter various organs through the blood circulation to cause pathological disorders of the nervous and cardiovascular systems and especially the liver and the kidney. For the purpose of studying these pathological changes and determining the inorganic phosphorus content of the liver and the kidney, 10 rabbits were experimentally burnt with phosphorus. Of the group, 5 died within 72 hours, 2 died in 4-7 days, and 3 were killed 28 days after burning. A group of 4 healthy rabbits was used as the control. After dissection, pathological changes of the heart, lungs, kidneys, liver, and brain were observed and recorded; 20 g of liver tissues and 10 g of kidney tissues were taken for phosphorus determination. Although qualitative tests of the tissues all indicate high positive, quantitative tests do not indicate a high content. It is perhaps necessary to perform the test immediately after death.

AUTHOR: XIAO Guangxia [5135 0342 1115]
WANG Dewang [3769 1795 2489]
ZHANG Yaping [1728 7161 5493]
LIU Mingzheng [0491 2494 2398]

ORG: All of the Third Military University of Medicine First Hospital

TITLE: "Clinical Significance of Bacterial Counts in Burns"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 139-140

ABSTRACT: Bacterial examinations are developing from qualitative to quantitative and from the surface to the deep layer tissues. In Mar-Sep 80, the authors performed bacterial culture and identification of tissue specimens below 73 burnt scars of 18 victims, suffering, on the average, from about 54.6 percent of third degree burns of the body. From the specimens, 110 bacterial strains were obtained. This paper discusses the fact that quantitative determination or bacterial counts can reflect the amount and type of pathogenetic bacteria that have invaded the deep, nonburnt tissues, and ratio of the various bacterial strains. Studies on the relationship between the bacterial count and the success or failure of skin transplant and the relationship between the bacterial count and the duration after the burn are also reported.

AUTHORS: CHEN Siguang [7115 [illegible] [illegible]]
CHEN Huanyong [7115 3562 0516]
HU Dingjin [5170 1353 6855]

ORG: All of Guangzhou Troop Military Medicine Research Institute

TITLE: "Isolation and Identification of Dengue Virus From the Fushan District of Guangdong"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 pp 141-144

ABSTRACT: In the period between Jul and Oct 78, there were more than 2,000 cases of high fever, muscular pain, joint pain, and skin rash. Dengue fever was suspected. Under the cooperation and guidance of Research Institute of Microbiology and Epidemic Diseases of the Military Academy of Medical Sciences, a project of isolation and identification of the virus was carried out. With the rat brain infection technique, 5 strains of viruses were isolated from 42 cases of acute victims clinically diagnosed to be dengue fever. The original incubation period was found to be 12-17 days; 10-14 days for the second-third generations of virus, and 9-12 days for the fourth and fifth. The pathogenicity and the incubation period began to stablize after the third to fifth generation, and the toxicity of the virus increased with the number of generations cultured.

AUTHOR: LI Yutang [2621 5940 2768]
QIN Yizhong [4440 0001 0022]
ZHAI Yao [5049 3852]
GONG Jianzhang [7895 1696]

ORG: All of Field Study Group, Research Institute of Malaria Control and Treatment, Second Military University of Medicine

TITLE: "Treatment of Chloroquine-resistant Falciparum Malaria With Hydroxypiperaquine Phosphate"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 3, Jun 81 pp 157-159

ABSTRACT: Following reports of chloroquine-resistant falciparum malaria in Central and South America and Southeast Asia, such cases have also occurred in Hainan Island and the southern border of Yunnan Province in China. There is an urgent need of finding a new and effective drug of low toxicity. The Pharmaceutical Chemistry Research Group of the Second Military University synthesized the new antimalaria drug, hydroxypiperaquine phosphate, which was proved to be effective for pernicious malaria [= falciparum malaria] and side effects of the drug are few. In Jun-Nov 1979, 158 cases of falciparum malaria were treated in Hainan Islands with chloroquine to produce 66 cases of the chloroquine-resistant variety. The new drug was administered, and the fever receded within 96 hours in all 66. Follow-ups in 21 and 28 days disclosed 3 cases of recurrence, amounting to 9.38 percent.

6248
CSO: 4009/411

AUTHOR: ZONG Ruhou [1350 3067 0624]
YANG Meixiao [2799 5019 1366]

ORG: None

TITLE: "Signal Fluctuations Observed During the Symphonie Experiment"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 4, Apr 81 pp 17-20

ABSTRACT: This paper reports the signal fluctuation phenomenon caused by low level atmospheric turbulent currents,observed at the surface station of Hongqiao, Shanghai, in 1978-79 during its participation in the Symphonie Satellite Communication Experiment. The recorded typical signal fluctuation curve and the statistical data of the worst month are given. The data are compared with the meteorological parameters of the region of Shanghai and the geographical condition of the area surrounding the surface station for an analysis of the causes of such signal fluctuations.

AUTHOR: CHEN Yunzhi [7115 0061 1807]

ORG: None

TITLE: "Multiplexing of Time Slots for Time Division Digital Switching Systems"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 4, Apr 81 pp 37-41

ABSTRACT: Digital time division switching is in reality time slot switching, with time slot multiplexing its necessary preparation. This is different from the multiplexing of the PCM transmission system. This paper first discusses the relationship between multiplexing of time slots and time slot switching, with emphasis on an analysis of the multiplexing action and the concrete method of its realization. Finally, a circuit design formula is proposed, using the 1024 multiplexing of time slot device formed by intermediate and small scale integrated circuits. Actual connection and property tests have proved the design to meet the speed requirement of 8192kb/s. The circuit design is simple and the operation is stable and reliable.

6168
CSO: 4009/416

Water Conservation

AUTHOR: None

ORG: Ministry of Water Conservancy Team Touring the USA to Observe Water and Soil Conservation

TITLE: "Report of the USA Tour to Observe Water and Soil Conservation"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 1, 81 pp 22-29

ABSTRACT: In accordance with the Sino-American Agricultural Cooperation Plan of 1980, the Ministry of Water Conservancy dispatched a team of 5 persons to tour the USA to observe the water and soil conservation, irrigation and drainage, and flood and waterlogging prevention practices in that country. The team arrived in Washington D. C. on 22 May 80 and stayed for one month. Following a brief report of the essential data of water and soil resources and agricultural production condition of the USA, the history of efforts, laws, and practices in the USA to control soil erosion is introduced. Engineering structures to provide irrigation and drainage are the obvious factor in promoting agricultural production, but soil salinization in the irrigated regions remains a serious problem. According to surveys of the 60's, it affects 30 percent of cultivated acreage in the country. The importance of the Mississippi in the USA is like the Changjiang and Huanghe combined in China. Problems and attempts for flood control of that river are introduced. It is said that urban

[continuation of SHUILI SHUIDIAN JISHU No 1, 81 pp 22-29]

transportation needs are taking up 6 million mu of superior farmland every year; market price of agricultural products fluctuates a great deal; new structures have to be built to replace old water conservation projects to meet the requirements of agricultural machines which are forever becoming larger in size; the State is reducing the amount of capital investment in small river valleys; some areas are not as well taken care of as others and the no-plowing technique has created some concern among the farmers. Merits and problems of water and soil conservation practices in the USA are outlined in this report.

ORG: Bureau of Planning and Designing Management, Ministry of Water Conservancy

TITLE: "Zhujiang [Pearl River] Valley Planning Cooperative Conference Held in Fushan, Guangdong Province"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 1, 81 p 57

ABSTRACT: The Zhujiang Valley Planning Cooperative Conference was called by the Zhujiang Water Conservancy Committee of the Ministry of Water Conservancy on 25-31 Oct 80 in Fushan City. Participants included more than 60 persons in charge of water conservancy, electrical power, transportation, agriculture, environmental protection, etc. of the provinces of the Zhujian Valley and related departments of the central government. The Zhujiang Valley Project was proposed and revisions to that document were discussed. The work of the project was preliminarily formulated to be presented to the central government for further revision. The Minister of the Ministry of Water Conservancy, Qian Zhengying [6929 2973 5391] delivered the closing speech in which she emphasized the necessity of completing the project in 10 years in order to realize the 4 modernizations and in order to accomplish this it is essential that the various provinces should seek cooperation to investigate, reform, and be comprehensive and realistic. She urged everyone present to propose a comprehensive formula that is technically feasible and economically reasonable to produce the maximum overall benefit at a minimum possible cost.

AUTHOR: ZHU Hongxi [2612 3163 3556]

ORG: Water Conservancy Survey and Design Academy, Ministry of Water Conservancy and Shanxi Province

TITLE: "Preliminary Evaluation of Water Resources of Shanxi Province

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 2, 81 pp 1-8

ABSTRACT: On the basis of the polulation, the average stream runoff in Shanxi Province is only 500m^3, amounting to 18.5 percent of the nation's average. Based upon the natural condition of the province, this paper attempts to give a unified assessment of surface and ground water resources. Following a discussion of the conditions of supplementation, runoff, and drainage, and using the equation for natural water balance, the total water resources of the province are computed. Problems with regard to the influence of evaluation of the ground water resource on the evaluation of total water resource, the deep ground water runoff, and the water loss through evaporation are discussed. Finally, a hydrological map and an isogram of water resources of the province are presented. The paper also includes, briefly, several ideas of the author concerning the solution to the problem of water deficiency of the province. Essentially, the solution depends upon artificial means of influencing the climate and upon research on transferring southern waters to the north.

AUTHOR: ZHAN Jiaxin [6124 1367 9515]

ORG: Department of Water Conservancy, Hunan Province

TITLE: "Small Hydroelectric Power Stations are the Major Energy Source of Rural Villages in Hunan"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 2, 81 pp 59-61

ABSTRACT: Hunan is a province of no petroleum and little coal. Although prospecting is being carried on, no large oil reserve has been discovered to date. Coal reserve is very limited, only about 28.5 x 10^8 tons, to be used up in 40-50 years at the current rate of mining. There are more than 600 x 10^8 tons of bone coal reserve, with a heat energy of 800-2,000 Cal/kg, and a great deal of research is needed for its utilization. Solar energy, wind energy, and nuclear energy are all still in a research stage. Marsh gas is very promising for rural villages, but in terms of energy output and simplicity of utilization, it still cannot be compared with small hydroelectric power stations. There is an urgent shortage of fuel for daily living in Hunan. At present, the people depend upon firewood and the need is 300,000 tons per year. In many places, trees and grass roots have been exhausted to leave barren mountains and serious problem of water and soil loss and the destruction of the ecological balance. This leaves the development of small hydroelectric power the major solution to the problem. The bulk of the paper is devoted to introducing the past history and the future prospect of developing small hydroelectric power in the province.

AUTHOR: MEI Zhengxing [2734 2973 2502]

ORG: Karst Scientific Research Team, Department of Geology, Guizhou College of Engineering

TITLE: "Application of Lycopodium Spores [Club Moss] in Ground Water Linkage Test in China"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 3, 81 pp 35-39

ABSTRACT: The technique of using club moss spores to trace ground water connections has been frequently reported in foreign countries. It was introduced to China in 1974 and has since been used in regions of karst development in China, such as Guangxi, Guizhou, etc. The practice of the past several years proved it to be very effective. This paper reports the special characteristics of these spores, the method of staining the spores and storing them, the technique of depositing the stained spores and of taking samples of spores, the technique and equipment for spore examination, and the technique of processing and interpreting the data.

AUTHOR: FANG Jinju [2455 6855 5418]

ORG: Dali County Water Conservancy Survey Design Team, Yunnan Province

TITLE: "Large Electric Compacting Test Instrument Successfully Made"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 3, 81 pp 61-62

ABSTRACT: The Civil Engineering Office of the team has successfully made 2 large electric compacting test instruments. The rotary compacting hammer is automated to improve the compacting function, to guarantee the precision of the test, and to reduce the labor intensity. Since the instruments were completed, it has been used for testing 7 dirt and random material engineering projects in Dali and Chuxiong counties with ideal results. The theory, the major structure, the range of application, and the major technical specifications of the instrument are introduced. The paper also includes a structural drawing and a photo of the instrument.

AUTHOR: BAI Lin [4101 2651]

ORG: Bureau of Field Water Conservancy, Ministry of Water Conservancy

TITLE: "Prospects of Small Hydroelectric Power Development in China"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 4, 81 pp 55-59

ABSTRACT: The development of small-scale hydroelectric power in China began in the early 50's. The major characteristic is the close unity of flood control and power generation, in an effort of mobilizing local and brigade capabilities to provide energy for the use of rural villages. By the end of 1979, 90,000 such power stations have been completed in the country, having a capacity of 6,300,000 kw, or 30 percent of the hydroelectric power of the nation. In Jan-Nov 80, 700,000 kw were added, with another 2,000,000 kw now under construction. Small hydroelectric power stations are economically reasonable in China, averaging 1000-1300 yuan/kw of construction cost. This is higher than the per kw cost of medium and large power stations, with all the capital investment coming from the State. With small power stations, the State provides only 1/4 to 1/3 of the construction cost. Moreover, the power is supplied to nearby users and long distance transmission lines are not needed. The paper also argues against the idea of a recent paper in NENGYUAN ZHENGCE TONGXUN (No 19, 80) that China's small hydroelectric power resources are not rich and large and medium power stations should be emphasized. Several survey data are given to support the author's viewpoint that the existing small hydroelectric power amounts to only 10 percent of China's potential.

AUTHOR: LIU Jun [0491 0193]

ORG: Changchun Machine Research Institute, Ministry of Water Conservancy

TITLE: "Prototypes of the SLQ$_y$ Series Amphibian Dredges Successfully Made"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 4, 81 p 63

ABSTRACT: The SLQ$_y$ series amphibian dredges are made by the Changchun Machine Research Institute of the Ministry of Water Conservancy, the Sanmenxia Hydrological Engineering Machinery Plant, and Changchun Water Conservancy Machinery Plant, based upon the special needs of the Huanghe Irrigation District of Ningxia and Neimenggu. The work of designing the machines of this series began early in 1980 and was completed in late Aug of the same year. The capacity of the bucket of the SLQ$_y$-20 and the SLQ$_y$-40 is 0.2 and 0.4 m^3 respectively. They operate either in water or on land. They may be used to clean irrigation ditches, artificial waterways, lakes, ponds, and small harbors to make them deeper, etc. They may also be used to dig various drainage ditches, building foundations, etc.

AUTHOR: LI Jianshu [2621 1696 2873]

ORG: Design Academy, Guangxi Bureau of Water Conservancy and Electric Power

TITLE: "Preliminary Investigation of the Verification of Maximum Modern Flood Level and Its Application"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 6, 81 pp 24-33

ABSTRACT: The concept of modern climate is, strictly speaking, a product of the modern natural geographical condition. The meteorologists analyzed with isotopes, geology, and phenology and concluded that the present day is about ten thousand years after the conclusion of the last Quaternary glaciation. There have been 4 cooling off periods in these ten thousand years, with the 4th one around the year 1725. Using phenological techniques, China's meteorologists have produced a figure depicting the climatic changes in China during the past five thousand years. These changes basically correspond to the climatic fluctuations of the rest of the world. The idea of the maximum flood level is calculated on the basis of a cooling off period when the snow line is the lowest. Horizontal silting occurs during that period also. Phenological evidences supporting this theory and its application in the calculation and estimate of the maximum flood volume of such hydrological structure as the Jincheng Hydroelectrical Power Station are discussed.

AUTHOR: HUANG Yonglu [7806 3057 7120]

ORG: Technology Team, Work Site No 2, Bureau of Hydroelectricity No 6, Ministry of Hydroelectric Power

TITLE: "Leakage Treatment of Earth-stone Cofferdam--The Blast Pressure Method"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 6, 81 pp 62-63

ABSTRACT: The engine site of the Taipingxiao Power Station in the Northeast had to be completed before the 1977 flood season. The foundation for the cofferdam was dug and concrete was poured to a height of 160.6 m. In the middle of Mar 77, several leaks were discovered. As the quantity of water rose, vertical cracks in varying widths of 1-3 cm and subsidence phenomenon were also detected. The water changed from clear to murky and finally turned into a slurry. The foundation was completely submerged in 4 hours. The cause of the leakage was determined to be the fact that when the dam was constructed the temperature at night dropped to -10°C to cause the material to turn into frozen earth. With the arrival of spring, the temperature rose and the frozen lumps of sandy earth thawed. Two schemes of repair were taken into consideration: throwing clay onto the side of the dam facing the water or digging two vertical holes into the dam and filling them with dynamite to use blast shock wave to compress and plug the leaks. As the flow speed of 1.67 m would wash away any clay, the blast technique was adopted and the result was satisfactory.

6248
CSO: 4009/401

END

JPRS 78836

26 August 1981

China Report

SCIENCE AND TECHNOLOGY

No. 121

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78836

26 August 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 121

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Special Computer Study Groups Formed
(DIANZI JISUANJI DONGTAI, No 6, 1981) 1

APPLIED SCIENCES

Gezhou Dam Monitoring Instruments Said Effective
(Zhao Chengyi, Geng Shouren; CHANGJIANG RIBAO, 12 Jun 81) 5

JS-440 Industrial Control Computer System Outlined
(Xu Xinchuan; DIANSHIJIE, No 5,1981) 6

Optical Cable Communications System Set Up
(Zhang Dungong; BEIJING RIBAO, 20 Jun 81) 9

LIFE SCIENCES

Study Conducted of Hereditary Factors in Schizophrenia
(Kuang Peigui, et al.; SHENJING JINGSHEN JIBING ZAZHI,
No 2, 1981) 10

PUBLICATIONS

Table of Contents of 'DABA GUANCE YU TUGONG CESHI' No 2, 1981 ... 17

Table of Contents of 'QICHE JISHU' No 5, 1981 18

Table of Contents of 'TONGXIN XUEBAO' No 1, 1981 20

ABSTRACTS

GEOLOGY

DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA], No 2, 1981 22

SPECIAL COMPUTER STUDY GROUPS FORMED

Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 6 1981 p 64

[Text] The special study groups are the foundation of the computer committee's work in that they are key components of the committee. Their purpose is to further the development of related disciplines and the computer industry, to train qualified personnel and to form different schools of thought. At the working session for special study groups in mid-January, the Electronic Computer Committee of the China Electronics Society decided to establish 12 groups and 6 additional groups were planned. These are listed below. The working session also discussed in detail duties and responsibilities, principles on which to base the division of effort and leadership and membership composition of the special study groups. Some methods and regulations were formulated.

Order	Name	Group Leader	Person or unit responsible for the group	Contacting address	Remarks
1	Systems Design and Composition		The entire original body	Chen Renfu- East China Computer Institute	
2	Micro-programming			Gao Qingshi- Chinese Academy of Sciences Computer Institute, Jiang Xueguo- North China Computer Institute	
3	Computer Theory		National Defense University of Science and Technology, East China Computer Institute		
4	Network and Data Communications	Li Feng		Ministry of Posts and Telecommunications Data Transmission Research Institute	
5	Micro-computers	He Shaozong		Shaanxi Micro-electronics Research Institute	
6	Computer-Aided Design		National Defense University of Science and Technology, East China Computer Institute		

Order	Name	Group Leader	Person or unit responsible for the group	Contacting address	Remarks
7	Nonnumeric Computer Applications	Wang Nengbin		Nanjing Engineering College Computer Department	
8	Computer Applications in the National Economy	Liu Shihua		Fourth Ministry of Machine Building Institute No 6	
9	Computer Pattern Recognition		Xuan Guorong	Xian Jiatong University Department of Information and Control Engineering	
10	Artificial Intelligence		Wang Xianghao	Jilin University	
11	Information Storage Technology	Fan Xinbi		Chinese Academy of Sciences Computer Institute	
12	Computer Power Source	Li Daokai		Chinese Academy of Sciences Computer Institute	
13	Computer Structural Technology and Construction Techniques	Guo Junchuan		North China Computer Institute	
14	Software	Xu Jiafu		Nanjing University Computer Department	
15	Peripheral Equipment	Yao Xishan		Sichuan Shifang Box 11	

Order	Name	Group Leader	Person or unit responsible for the group	Contacting address	Remarks
16	Computer Education	Zhang Shilong		Beijing University Computer Department	At the Aug 1981 meeting in Emei, 9 leading members were selected.
17	Maintenance Technology	Huang Changduo		Chinese Academy of Sciences Computer Center	
18	Chinese Character Information	An Qichun		State Economic Commission Electronics Bureau	

CSO: 4008/453

GEZHOU DAM MONITORING INSTRUMENTS SAID EFFECTIVE

Wuhan CHANGJIANG RIBAO in Chinese 12 Jun 81 p 1

[Article by Zhao Chengyi [6392 2052 5030] and Geng Shouren [5105 1343 0088]: "Gezhou Dam Engineering Project's Nearly Four Thousand Monitoring Instruments Serve Their Function; The Dongfanghong No 51 Vessel Participating in Experimental Navigation Is Equipped With a New Type of Wireless Telephone"]

[Text] Special report from the Gezhou Dam Site by CHANGJIANG RIBAO, June 11: This afternoon, this reporter learned from the Gezhou Dam construction site design representatives office of the Changjiang river valley planning office: The Gezhou Dam water conservancy project has nearly 4,000 "sentries" that can hardly be detected. They are intently holding their positions and serving effectively.

These so-called "ears and eyes" and "sentries" of the dam refer to the various types of monitoring instruments on top and below the dam. They observe changes in the dam using methods of optical measurements, measurements of the power source and the tubes and pipes to understand the safety and the utilization of the dam structures. They accurately provide various types of data for the scientific research and design personnel to carry out analysis and studies in time to examine the results of the design of the dam so that the scientific and technical level of building large dams in our nation can be continuously improved.

Related report: Today the communications group of the command headquarters of test navigation of Gezhou Dam equipped the Dongfanghong No 51 vessel with a very high frequency (VHF) wireless telephone which is of an advanced level in our nation at present to directly serve test navigation.

The VHF wireless telephone is a new type of wireless telephone that is strongly resistant to interference and which has a large emitting power. It can convert wired telephone into wireless telephone and convert wireless telephone into wired telephone communications. The Dongfanghong No 51 is the first vessel navigating along the entire Changjiang to be equipped with such a telephone at present.

According to the demands of test navigation, the Dongfanghong No 51 vessel is required to communicate with eight dispatching points above and below the dam during test navigation. After installation of the VHF wireless telephone today, test communication results were good.

9296
CSO: 4008/413

JS-440 INDUSTRIAL CONTROL COMPUTER SYSTEM OUTLINED

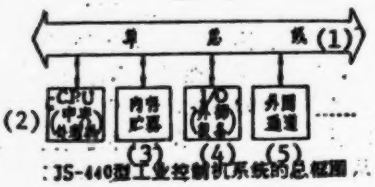
Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 5, 81 pp 4-5

[Article by Xu Xinchuan [6079 1800 0278] of the Shanghai Regulator Plant Industrial Control Computer]

[Excerpt] JS-440 Industrial Control Computer

The JS-440 model industrial control computer is a model of the JS-400 series industrial control computer manufactured by our plant. It has similar function as the PDP-11/35 model computer produced by the DEC Company of the United States. The PDP-11 series computers are widely used in the world. Our nation has also introduced many units. The following is a brief introduction to the JS-440 model industrial control computer:

The JS-440 model industrial control computer is a 16-bit binary parallel logic computer, it uses the complement of 2 to carry out computations, it has 28K bytes of internal memory (can be expanded to 124K bytes). The system uses selectable components (such as multiplication, division, floating point processing), it is convenient for the users to use. At the same time, it uses address relocation and protective methods to compose a perfect memory control equipment. To execute multiple programs, its central processing unit uses the core method and the user method as two types of operation. By fully utilizing this characteristic, a software operating system can make sure (in the user method) that the user will not cause the entire system to break down or cause damage. The entire control component is on the control panel which is controled by the operator using the core method operation. The general block diagram of the JS-440 industrial control computer system is illustrated in the accompanying diagram.



JS-440型工业控制机系统的总框图

The general block diagram of the JS-440 industrial control computer system

1. Unibus
2. CPU (central processing unit)
3. Internal memory
4. I/O (peripheral equipment)
5. Peripheral channels

1. UNIBUS All of the components of the system use the same method of communication through the unibus. Address, data and control information are transmitted along the 56 lines of the bus. Each component or equipment connected to the unibus uses the same form of communication and they all have a uniform coded address. Thus, it is not necessary to set up special input and output commands, and at the same time, data transmission of some input and output devices can bypass the central processing unit (CPU), and in this way, design of the interface is convenient and multiple processors can operate.

2. The Central Processing Unit (CPU) It acts as a subsystem connected to the unibus, it controls timing, arithmetic executions and logical computations and decoding of commands from the unibus to the peripheral equipment. The expanded command system and the floating point processing unit are selective components equipped within the central processing unit for fixed point and floating point computations. The machine has two operating methods, the core method and the user method. When the machine is operating in the core method, one program is used to control the machine. When operating under the user method, the execution of certain commands of the central processing unit is blocked and the machine refuses to access commands directly from peripheral equipment of the system and to store commands directly into peripheral equipment. This characteristic of the hardware provides a protective measure for a perfect execution in a multiple program environment.

3. Internal Memory This uses a magnetic core memory designed to adapt to 16-bit words as well as 8-bit bytes. Each word consists of two bytes. Address coding uses the byte as the unit, the address code of the word is always labeled by an even number. At the same time, low order bytes are stored in the even numbered units and high order bytes are stored in the odd numbered units.

4. Peripheral Equipment and Peripheral Channels The peripheral input/output devices are mainly the control panel typewriter, the photoelectric paper tape input device, the high speed paper tape puncher, the line printer, the X-Y plotter, the CRT symbol display, magnetic tape, magnetic disk, which are all connected to the mainframe by interfaces. The peripheral equipment includes analog input and output devices, switching input and output devices, display, alarm, clock. These devices and channels can be selectively equipped according to user's needs.

5. Software A wide range of software consists of magnetic disk and paper tape systems.

(1) Paper tape software: This includes the guided loading program, absolute loading and unloading program, absolute assembly program, input/output control program, paper tape editing program, error search program, floating point math package, chaining program, floating assembly program and the single user BASIC interpretive program.

(2) RT-11 front and back console operating system includes the monitoring program, and the systems program.

(3) RSX-11M real time control program includes a monitoring program and a systems program.

(4) Language: High order language, FORTRAN IV; commercial language, COBOL; control language, KSY.

Future of the Industrial Control Computer

According to the situation of manufacturing and using the industrial control computer in our nation and abroad, it can be seen that the direction of development of the industrial control computer is towards: (1) the development of series, large sized machines, micro-sized machines, and networks; (2) technology oriented, reliability, cost reduction; (3) strengthening of peripheral equipment, manufacturing of peripheral devices, especially magnetic disks, non-impact type printers, high speed and medium speed sampling converters; (4) strengthening the research and manufacturing of basic software and applications software, especially the development of control languages; (5) training of personnel in manufacturing industrial control computers, maintenance and operation.

In general, the development of industrial control computers will further benefit mankind.

9296
CSO: 4008/413

OPTICAL CABLE COMMUNICATIONS SYSTEM SET UP

Beijing BEIJING RIBAO in Chinese 20 Jun 81 p 1

[Article by Zhang Dungong [1728 2415 1872]: "Our Nation's First Optical Cable Communications System Is Set Up in Beijing; It Has a Large Capacity, Is Reliable, Is Strongly Resistant to Interference; Eavesdropping Is Difficult; It conserves Copper Materials"]

[Text] Our nation's first 3.3-kilometer, 120-channel optical cable communications system has begun trial operation in our city at the beginning of June. This is one of the major scientific research achievements of our city, and it signifies that our city's telephone communications has begun to enter into a new stage. This optical cable communications system was completed in Beijing in September, 1979. It is installed between the telephone branch offices No 86 and No 89. After over one year of parallel network experiments and improvement, it has now completed its predetermined plans. The scientific committee of Beijing City held an evaluation meeting during the first 10 days of June. The meeting held that the various transmission characteristics of the 3.3-kilometer optical cable communications system in Beijing are basically stable, the practicality has reached the advanced levels in our nation at present, it already possesses conditions for trial operation in the field, and it can be handed over for trial operation and shoulder the tasks of daily telephone communications.

The optical cable communications system consists mainly of three parts, the electrical terminal, the optical terminal and the optical cable. The optical cable is made of silicon dioxide light guiding fibers. In the optical cable, light waves replace electrical waves in the electrical cable to realize transmission of information. Optical cable communications has a large communications capacity, its reliability is good, its resistance to interference is strong, eavesdropping cannot be easily done and it conserves copper materials. It is a means of communication that has a future for development. During the 1970's, this new technology was studied and developed internationally and competitively. At present, only a few nations have realized commercial applications, and most of the nations are still in the trial use stage.

The research work for optical cable communications in Beijing began in 1976. Under the support of the State Scientific and Technological Commission and the Ministry of Posts and Telecommunications, the Beijing City Scientific Committee organized Beijing's schools of higher education, the scientific research academies and institutes, factories and the Beijing City Telecommunications Bureau totaling over 20 units and spent 5 years to develop the system successfully. This research achievement has contributed towards developing the capitol's communications business.

9296
CSO: 4008/413

LIFE SCIENCES

STUDY CONDUCTED OF HEREDITARY FACTORS IN SCHIZOPHRENIA

Guangzhou SHENJING JINGSHEN JIBING ZAZHI [JOURNAL OF NERVOUS AND MENTAL DISEASES] in Chinese No 2, 1981 pp 85-87

[Article by Kuang Peigui [6782 1014 2710], Liu Mulan [0491 1970 5663], and Xiang Hong [0686 4767] of the Wuhan city psychiatric hospital, and Liu Xixian [0491 1585 6343] of the Biology Teaching and Research Laboratory of the Wuhan Medical School: "Investigation of Hereditary Factors in Schizophrenia"]

[Text] A general survey of schizophrenia has been conducted among the Wuhan city population of more than 2 million. The percentage of schizophrenia in the population survey was 0.21%; the percentage of schizophrenics among families found in genealogical analysis was 1.583%, seven to eight times higher than the general population. Of four pairs of schizophrenic twins, the disease occurred in three pairs within the same year and the clinical types were similar. In the same environment, the percentage of schizophrenia among relatives of patients was 1.458%, while the percentage among the control group of normal persons was only 0.278%; therefore it is believed that schizophrenia is closely related to hereditary factors, and in its prevention and control, attention should be paid to genetic counseling.

The cause of schizophrenia is still unknown today. In recent years, more people have come to believe that hereditary factors exert an important influence upon the occurrence of the disease. We have diagnosed and determined schizophrenia according to the six standards proposed in 1957 by the "schizophrenia research group of the World Health Organization" in Geneva, and have conducted an investigative analysis of the population, genealogy, twins and the environment to explore the relationship between schizophrenia and hereditary factors. The data of the surveys are as follows.

Data

Population Survey. From 1972 to the end of 1978, 2,346,638 persons in Wuhan city were surveyed according to leads and clues. A total of 4,891 schizophrenics were found by the general survey, or 0.21%. From March to August of 1979, general surveys were carried out among 300,189 long-time residents of a ward in a certain busy city and 553 persons were found to be schizophrenics, or 0.184%, similar to the 0.14% - 0.29% reported by localities throughout the nation.

Genealogical Analysis. Among 300 cases of hospitalized and diagnosed schizophrenics, 50 cases were selected from a random sampling and a detailed investigation was conducted of the ancestors and offspring, extending to four or five generations, and collateral relatives (schizophrenics who had died or individuals who were absent were investigated through a study of their case histories, events and final situation by detailed questioning of direct relatives; schizophrenics in the city were examined in person). The 50 family lines had a total of 3,416 members. There were 82 psychotics (including schizophrenics, incomplete psychological development, and epileptic psychosis), a total of 2.4%. Among them, 54 suffered from schizophrenia, or 1.6%, seven to eight times higher than the general population.

Of the 3,416 members surveyed, there were 1,830 males, including 31 schizophrenics (1.7%); and 586 females, including 23 schizophrenics (1.5%). The difference between the percentages of male and female schizophrenics was not significant ($X^2 = 0.324$, $P > 0.05$). There were 1,463 persons on the paternal side, 24 of them schizophrenics (1.6%), and 1,512 persons on the maternal side, 19 of them schizophrenics (1.3%). The difference in the percentage of schizophrenics on the paternal side and the maternal side was not significant ($X^2 = 0.781$, $P > 0.05$).

It can be seen from Table 1 that the percentage of schizophrenia among first-level relatives is higher than among second-level relatives, and the percentage of schizophrenia among second-level relatives is higher than among third-level relatives. This shows that the closer the blood relationship, the higher the percentage of the disease.

Survey of Twins. We surveyed a total of 289 schizophrenic family lines and discovered four pairs of twins; three of the pairs were schizophrenic patients, and in the other pair, the younger brother had schizophrenia, while the older brother had an introverted personality. (see Table 2)

Relationship Between Heredity and the Environment

We selected a certain factory where the environmental factors were relatively obvious and where the percentage of the disease was relatively high to carry out our survey. The factory had a total of 4,300 workers. There were 49 schizophrenics, or 1.14%. Among the 49 schizophrenics, we took a random sample of 30 cases and conducted a detailed investigation of four generations of direct and collateral relatives of their family lines. At the same time, we selected 30 normal persons from the plant who had basically similar conditions (sex, age, job, financial situation) in their family lines to the control group in the investigation. The results are shown in Table 3.

Heredity. Among the members of the family lines of 289 cases of schizophrenia, there were 117 cases with histories of psychosis, or 40.5%. There were 49 cases involving heredity from parent to child (among them, 14 cases involving heredity spanning three generations) and there were 20 cases in which the patients were siblings. There were 20 cases involving atavistic heredity, 14 cases involving collateral heredity between uncle and nephew and between aunt and nephew, and 14 cases involving scattered heredity.

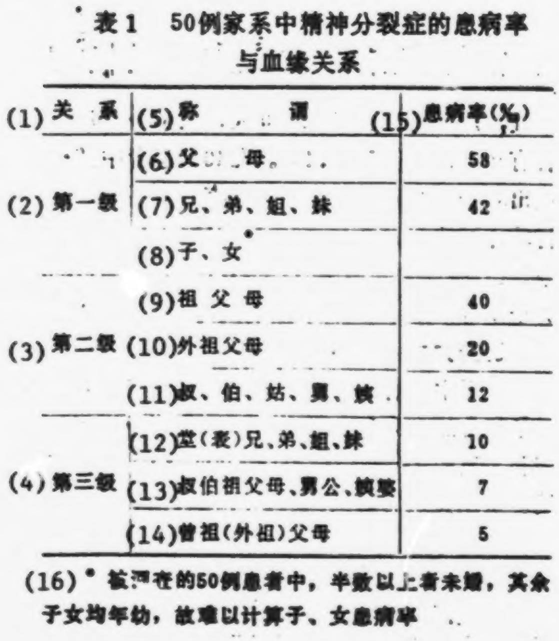


表1　50例家系中精神分裂症的患病率与血缘关系

(1)关　系	(5)称　谓	(15)患病率(%)
(2)第一级	(6)父　母	58
	(7)兄、弟、姐、妹	42
	(8)子、女*	
(3)第二级	(9)祖 父 母	40
	(10)外祖父母	20
	(11)叔、伯、姑、舅、姨	12
(4)第三级	(12)堂(表)兄、弟、姐、妹	10
	(13)叔伯祖父母、舅公、姨婆	7
	(14)曾祖(外祖)父母	5

(16)* 被调查的50例患者中，半数以上者未婚，其余子女均年幼，故难以计算子、女患病率

Table 1. Percentage of Schizophrenia and Blood Relationship in the Family Lines of 50 Cases.

1. Relationship
2. First level
3. Second level
4. Third level
5. Relationship
6. Father, mother
7. Older brother, younger brother, older sister, younger sister
8. Son, daughter*
9. Grandfather, grandmother (parents of the father)
10. Grandfather, grandmother (parents of the mother)
11. Father's younger brother, father's older brother, father's sister, mother's brother, mother's sister
12. Cousins (cousins)
13. Great uncles and great aunts on the father's side, great uncles and great aunts on the mother's side
14. Great grandfather and great grandmother on the father's side (on the mother's side)
15. Percentage of schizophrenia (%)
16. *Among the 50 cases of patients surveyed, over half were single; most of the children were young, and so the percentage of schizophrenia among the children was difficult to calculate.

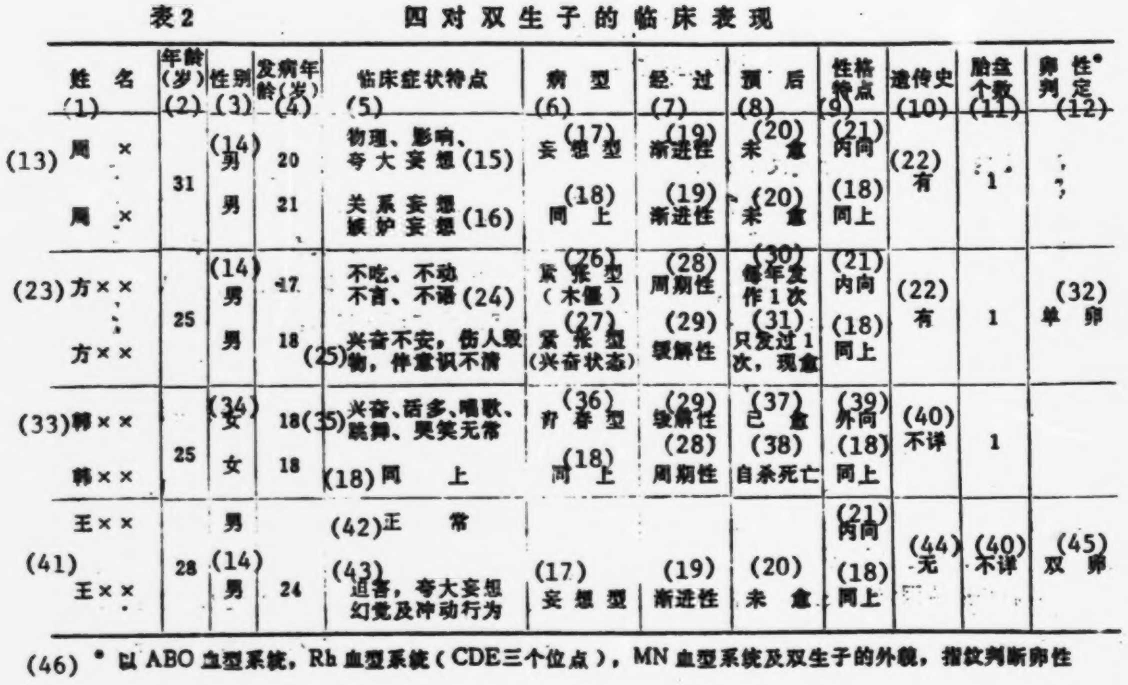


表2　　四对双生子的临床表现

姓　名 (1)	年龄(岁) (2)	性别 (3)	发病年龄(岁) (4)	临床症状特点 (5)	病　型 (6)	经　过 (7)	预　后 (8)	性格特点 (9)	遗传史 (10)	胎盘个数 (11)	卵性判定* (12)
(13) 周 ×	31	(14) 男	20	物理、影响、夸大妄想 (15)	(17) 妄想型	(19) 渐进性	(20) 未愈	(21) 内向	(22) 有	1	
周 ×		男	21	关系妄想 嫉妒妄想 (16)	(18) 同上	(19) 渐进性	(20) 未愈	(18) 同上			
(23) 方××	25	(14) 男	17	不吃、不动 不言、不语 (24)	(26) 紧张型（木僵）	(28) 周期性	(30) 每年发作1次	(21) 内向	(22) 有	1	(32) 单卵
方××		男	18	(25) 兴奋不安，伤人毁物，伴意识不清	(27) 紧张型（兴奋状态）	(29) 缓解性	(31) 只发过1次，现愈	(18) 同上			
(33) 韩××	25	(34) 女	18	(35) 兴奋、话多、唱歌、跳舞、哭笑无常	(36) 青春型	(29) 缓解性	(37) 已愈	(39) 外向	(40) 不详	1	
韩××		女	18	(18) 同　上	(18) 同上	(28) 周期性	(38) 自杀死亡	(18) 同上			
(41) 王××	28	男		(42) 正　常				(21) 内向	(44) 无	(40) 不详	(45) 双卵
王××		(14) 男	24	(43) 迫害，夸大妄想 幻觉及冲动行为	(17) 妄想型	(19) 渐进性	(20) 未愈	(18) 同上			

(46) * 以ABO血型系统，Rh血型系统（CDE三个位点），MN血型系统及双生子的外貌，指纹判断卵性

Table 2. Clinical Manifestations of the Four Pairs of Twins.

1. Name
2. Age
3. Sex
4. Age of occurrence of disease
5. Clinical symptoms and characteristics
6. Disease type
7. Course of disease
8. Outcome
9. Personality characteristics
10. Hereditary history
11. Number of placentas
12. Determination of number of ova*
13. Zhou x
14. Male
15. Physical symptoms, affective symptoms, delusion of grandeur
16. Associative delusion, jealous delusion
17. Paranoid
18. Same as above

[Key continued on following page]

19. Progressive
20. Not cured
21. Introvert
22. Yes
23. Fang x
24. Refusal to eat, refusal to move, refusal to talk, refusal to speak
25. Excitation and anxiety, harming other people and destroying objects, accompanied by unconsciousness
26. Catatonic (catatonia)
27. Catatonic (excited state)
28. Periodic
29. Gradual improvement
30. One occurrence a year
31. Only one occurrence, now cured
32. Single ovum
33. Han x
34. Female
35. Excited, talkative, singing, dancing, uncontrolled crying and laughing

36. Hebephrenic
37. Cured
38. Committed suicide and died
39. Extrovert
40. Unclear
41. Wang x
42. Normal
43. Persecution, delusions of grandeur, hallucination and impulsive behavior
44. None
45. Double ova
46. *Number of ova determined by the ABO blood type, Rh blood type (CDE positions), MN blood type and appearance and fingerprints of the twins.

表 3 ××工厂30例精神分裂症家系与对照组家系比较

(1)关系	(2)称谓	(3)患病组			(6)对照组		
		(4)人数	(5)患病数	‰	(4)人数	(5)患病数	‰
(7)一级	(8)父母	60	5	83.33	60	1	16.67
	(9)同胞	118	6	50.85	54	1	18.52
	(10)子女	90*	3	63.66	85	—	
(11)二级	(12)祖(外祖)父母	120	3	25.00	120	—	
	(13)叔、伯、姑、舅、姨	361	1	2.77	331	—	
	(14)侄、甥	226	2	8.85	289	—	
(15)三级	(16)堂、表兄、弟、姐、妹	442	2	4.52	476	2	4.20
	(17)叔伯、祖父母、舅公、姨婆	160	1	6.25	22**	—	
(18)合计		1,577	23	14.58	1,437	4	2.78

(19)* 被调查的30例患者共90名子、女中，16岁以上的为47名故患病率为63.66‰。

(20)** 对照组的第一代人数因供史不详，统计不全。

Table 3. Comparison of the Family Lines of the 30 Cases of Schizophrenia and the Control Family Lines at XX Factory.

1. Relationship
2. Relationship
3. Patients group
4. Number of persons
5. Number of schizophrenics
6. Control group
7. First level
8. Father, mother
9. Siblings
10. Sons, daughters
11. Second Level
12. Grandfather and grandmother on the father's side (on the mother's side)
13. Father's younger brother, father's older brother, father's sister, mother's brother, mother's sister
14. Nephew (brother's son), nephew (sister's son)
15. Third level
16. Cousins

[Key continued on following page]

17. Great uncles and great aunts on the father's side, great uncles and great aunts on the mother's side
18. Total
19. *Of the total of 90 sons and daughters of 30 patients surveyed, 47 were over 16 years old; the percentage of schizophrenia was 6.366%.
20. **The history of the number of people of the first generation of the control group is not clear; therefore the statistics are incomplete.

Discussion

Among the family lines of 80 schizophrenics surveyed in this article (including the family lines of 50 hospitalized patients and 30 factory patients), there was a total of 2,691 males, including 40 schizophrenics, or 1.48%; and 2,302 females, including 35 schizophrenics, or 1.52%. Sexual differences were not significant, indicating that there was no sex-linked heredity. Du et al reported one family line of a schizophrenic patient involving more female patients than male patients (12:5) and proposed the possibility of sex-linked heredity, but the information gathered for this article does not support this viewpoint.

There has been a lot of debate concerning schizophrenia as a disease transmitted by ordinary chromosome heredity. Some authors have proposed the monogenic theory (Slater, 1958); Kallmann believes schizophrenia is a kind of recessive heredity of the monogenic chromosomes, but Koller believes it is a dominant heredity. Some authors believe it is a dominant gene, especially an unusual zygote; sometimes the pathogenic function is not dominant, and thus the theory of incomplete dominant heredity has been proposed. There are also scholars who believe the occurrence of this disease is related to two or more kinds of genes, thus proposing the two-gene model (Karlsson 1974, Maricq 1975) and the polygene heredity theory (Gottesman and Shield 1972). Among the members of the 289 family lines, there were 14 cases involving heredity spanning three generations, 49 cases involving heredity between parent and children (including heredity spanning three generations), 20 cases involving patients related by having the same parents, 20 cases involving atavistic heredity, 14 cases involving collateral heredity (uncle and nephew, aunt and nephew), and 14 cases involving scattered heredity. These situations are difficult to explain by ordinary monogenic chromosome heredity. This article shows that the percentage of schizophrenia among first-level relatives (4.996%) is significantly higher than the percentage of schizophrenia in the general population (0.184%), and the percentage of schizophrenia among relatives of all levels drops significantly as the level of the relatives becomes lower. Also, according to reported information, the percentage of inherited schizophrenia is relatively high, reaching 70% to 80%. The percentage of schizophrenia among the first-level relatives of the patient approaches the square root value of the percentage of schizophrenia among the population (4.30%). Besides hereditary factors, schizophrenia is also affected by environmental factors. The above information is similar to the characteristics of the occurrence of polygenic hereditary diseases. Therefore, we believe schizophrenia involves polygenic heredity, coinciding with the views of some scholars in our nation and abroad.

When we surveyed the factory with a high percentage of the disease, we noticed that the factory practiced assemblyline operation, the work atmosphere was tense, the noise in the shop was loud, there were three shifts, and after the graveyard shift workers did not pay attention to resting at the proper time, with the addition of the more violent chaos of the Cultural Revolution; it appears that environmental factors were more predominant, but after comparison, we noted that the percentage of schizophrenia among members of the family lines of the group of patients was visibly higher than the control group (see Table 3), and the percentage of the disease among the control group was close to that of the population. This shows among the occurrences of schizophrenia, hereditary factors exert an important function while environmental factors may only be inductive.

Our work shows that developing genetic counseling and doing well the work of sterilization of the patients are important measures to prevent this disease. Patients should be discovered early and given timely and appropriate treatment, group prevention and group treatment must be developed, the rate of recurrence must be lowered and external unfavorable conditions must be improved to reduce the occurrence of this disease.

9296
CSO: 4008/396

TABLE OF CONTENTS OF 'DABA GUANCE YU TUGONG CESHI' NO 2, 1981

Nanjing DABA GUANCE YU TUGONG CESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 2, 1981 p 2

[Text] Checking of Systematic Error of Individual Instruments in Prototype Observation......Peng Hong [1756 5725], Third Engineering Bureau, Ministry of Water Conservancy	(3)
Improving the Accuracy of Movable Target Surveying on Horizontal Displacement of Dams......Ren Quan [0117 2938], Huadong Water Conservancy College	(11)
Investigation of Alignment Observation......Liu Jiaying	(15)
The Use of Regression Analysis in Studying Earth Dam Deformation......Cui Guofan [1508 0948 5400] and Gong Weixuan [7895 4850 4821], both of the Wuhan Hydropower College	(20)
Prototype Observation of Pore Pressure in the Loam Core of a Dam......Wang Chunsheng [3769 2504 3932], Bureau No 5, Ministry of Water Conservancy; Huang Jiaran [7806 1367 3544], Northwest Survey and Design Institute, Ministry of Electrical Power	(27)
Improving Pore Pressure Measurement in the Laboratory...... Chen Yujiong [7115 1937 3518], Rock and Soil Engineering Research Institute, Academy of Water Conservancy and Hydroelectrical Power Sciences	(37)
Classification of Triaxial Shear Test for Coarse-grained Soil and Its Application......Guo Qingguo [6753 1987 0948], Northwest Survey and Design Institute, Ministry of Electrical Power	(45)

9717
CSO: 4008/410

PUBLICATIONS

TABLE OF CONTENTS OF 'QICHE JISHU' NO 5, 1981

Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 5, 25 May 81 p 1

[Text] Survey Report

Views on Saving Energy and Developing Diesel Engine Motor Vehicles......Ji Fa [1323 4099], Changchun Automotive Research Institute (2)

Design and Research

Full Working Condition Simulation of Steady-state Turning Behavior (Part 1)......Guo Konghui [6753 1313 6540], Changchun Automotive Research Institute (8)

Matching an Axial-flow Fan with the Engine......Li Huizhen [2621 1920 3791], Jilin Institute of Technology (13)

Measurement and Study of Temperature of the Cylinder-head of Diesel Engines (Part 1)......Luo Xinmin [5012 2450 3046] and Qiao Huiying [0829 1920 5391], both of Chongqing Heavy Automobile Research Institute (18)

Technology, Equipment and Materials

Sub-eutectic Aluminum-Silicon Alloy--A New Material for Pistons......Zhang Yingcai [1728 5391 2088] and Ren Shukun [0117 2579 0981], both of the Changchun Automotive Research Institute (23)

A Computing Method for the Cam Copy of the Cam Grinding Machine......Jiang Zhaoyuan [3068 5128 3293] and Li Peisheng [2621 1014 3932], both of the Hanjiang Machine Tool Plant (28)

Improving the Surface Finish of Globoid Worm Teeth by a New Oilstone......He Guangyuan [0149 0342 3293], Automobile Plant No 1 (34)

Service and Maintenance

The Reason for the Jiefang Truck's Arm Rupture and Its Prevention......Peng Bingnian [1756 0014 1628], Lianyuan Company, Hunan Automobile Transportation and Management Bureau (35)

Quality Inspection and Adjustment of Carburetors...... Zhang Jiang [1728 3068], Transportation Office, Logistics Bureau, Hainan Military Region (37)

Oil Blow-by of the Air Compressor of the Jiefang Truck and Its Solution......Wang Xizheng (42)

A Tool for Cutter-adjustment for Boring Cylinders and Bushes ......Wu Mingzheng (44)

Environment Protection

Noise Level Control of the EQ 140 Heater......Wei Jiajun [7614 1367 7486], Automobile Plant No 2 (46)

Design Series

Selection of the Type and Design of an Automobile Trailer (Part V)......Chen Chuanxin [7115 0278 0207] and Zhang Xiuzhi [1728 4423 5347], both of the Hanyang Automotive Accessories Plant (54)

News from Abroad...... (58)

Questions and Answers...... (61)

9717
CSO: 4008/411

TABLE OF CONTENTS OF 'TONGXIN XUEBAO' NO 1, 1981

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 1, Jan 81

[Text] Papers and Reports

Calculation of Digital Optical Fiber Communication Systems ......Zhou Zisen [6392 2737 2773] (1)

Speech Processing System Implemented with Multiple Microprocessors......Li Changli [2621 2490 4539] (12)

Measurement and Analysis of Some Parameters of GaAlAs DH Lasers......Shan Zhenguo [0830 2182 0948] (26)

Interactive Word Processor for Chinese Data Processing...... Ni Guangnan [0242 0342 0589] (34)

An Approach to Two Different Algorithms for the Calculation of Reference Equivalent, Relative Equivalent and Loudness Rating......Cao Meijie [2580 2734 2638] (42)

The Strength of Glass Optical Fibers......Li Jiazhi [2621 1367 3112] and Wang Jianguo [3769 1696 0948] (51)

The Pre-equilization in the Multichannel Cable Transmission System......Zhu Gaofeng [2612 7559 1496] (61)

Sequential Detection of the Double Stationary Random Time-varying Channel......Li Daoben [2621 6670 2609] (73)

A Realizable Automatic Equalizing Circuit for PCM30/32 Regenerative Repeater......Sun Renqi [1327 0088 3823] (86)

Calculation of the Input Impedances of Cylindrical Doublet Antennae by the Application of the Static Electricity and Transmission Line Theories--An Amendment to the Equivalent Transmission Line Method......Ruan Yingzheng [7086 4481 6927] (96)

Academic Activities

A Brief Introduction to the Study Progress in CCITT Study Group XII......Yan Jianlan [0917 7234 5695] (107)

Note

A Brief Sketch of the International Conference on Communications ICC '80......Tang Rengheng [0781 0086 0077] (111)

9717
CSO: 4008/414

Geology

AUTHOR: LIU Zuhui [0491 4371 1920]
YUAN Hengyong [5913 1854 3196]
ZHANG Yixiang [1728 3015 4382]

ORG: All of the South China Sea Institute of Oceanology, Chinese Academy of Sciences, Guangzhou

TITLE: "The Relation between the Characteristics of the Gravity Anomalies and the Crust Structure in the Central and Northern Regions of the South China Sea"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 105-112

TEXT OF ENGLISH ABSTRACT: The data collected in the gravitational and geomagnetic measurements conducted in the South China Sea (λ 22°-12°N, φ 109°-117°30'E) during recent years show that the different types of crustal structures in the regions studied exhibit different geophysical characteristics.

The crustal structure of the continental shelf and the islands is similar to that of the continental margin. The Bouguer's gravity anomalies are of low values. The free-air gravity anomalies are mostly positive. The isostatic gravity anomalies range from +13 to +20 mgal, and the depth of Mohorovicic discontinuity is generally about 30 km. The magnetic anomalies are of low values which change slowly and have the superpositions of the sub-anomalies. All these obviously reflect the characteristics of the continental crust.

[Continuation of DIZHI KEXUE No 2, 1981 pp 105-112]

The amplitude of the Bouguer's gravity anomalies of the continental slope and the island slop show a larger fluctuation, about 110 mgal. The free-air gravity anomalies are comparatively weak positive or negative anomalies. The depth of the Mohorovicic discontinuity is about 20 km. The signs of magnetic anomalies also change alternately between positive and negative. All these reflect that the earth's crustal structure is of a transitional type from continental to oceanic.

The values of the Bouguer's gravity anomalies of the deep-sea basin are larger than "middle value," among which those of "higher values" account for two-fifths of the deep sea basin area of the survey region. The depth of the Mohorovicic discontinuity, except that of several isolated sea mountains, is about 10 km. According to the assumption based on the characteristics of the magnetic field, the basement is composed of the oceanic type of basalt, reflecting that the crustal structure here is similar to oceanic.

AUTHOR: SHUI Tao [3055 3447]

ORG: Zhejiang Institute of Geology, Hangzhou

TITLE: "Research on Mesozoic Volcanic Structure in Zhejiang Province"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 113-121

TEXT OF ENGLISH ABSTRACT: This paper deals with the problems pertaining to the methodology of regional volcanic structure, and puts forward an approach to the methodology with the study of volcanic structural traces as the starting point combined with regional geology, geophysical field and geochemical circumstances. Following this method, the author has researched the general features and laws of the volcanic structure of continental facies, expounds on the restrictive relationship between the regional horizontal stress field and point vertical stress field under the action of volcanic magma, and analyzes the framework structure of the volcanic basement. In addition, based on some geological data of strontium isotope, this paper also discusses the origin of volcanic substance and its relationship with regional geotectonics.

AUTHOR: LU Yanchou [4151 3348 0321]

ORG: Institute of Geology, National Bureau of Seismology, Beijing

TITLE: "Pleistocene Climatic Cycles and Variation of $CaCO_3$ Contents in a Loess Profile"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 122-131

TEXT OF ENGLISH ABSTRACT: There are 13 loess units and 14 fossil soil layers in a Middle-Late Pleistocene profile with a thickness of 76 m in Louchuan, Shanxi Province. Based on the weathering-pedogenic degree, the loess units may be divided into the weak pedogenic, medium pedogenic and strong pedogenic loess, and the soil layers may be divided into black-loessial soil, carbonate drab soil, drab soil, luvic drab soil and drab-brown earth, respectively (Lu and An, 1979). The statistical tests, including analyses of variance and regression of the relationship between percentage of $CaCO_3$ and the ratios of microline (Mm)/quartz (Mq) and calcite (Mc)/quartz (Mq) in loess and soil layers, indicate that: (1) a significant difference is presented among the three classes of loess and five types of soil in the profile; (2) a positive linear relation exists between the percentage of $CaCO_3$ and Mm/Mq ratio, and both factors decrease from the weak pedogenic loess to the drab-brown earth. As a result, by taking $CaCO_3$ contents in the different levels in the profile as an index, it is possible to characterize the bio-climatic environments in which loess units or soil layers were formed.

[Continuation of DIZHI KEXUE No 2, 1981 pp 122-131]

Using two hypothetic age models constructed on the basis of the available data of magneto-stratigraphy, radiocarbonate date and TL date, we have made a spectral analysis of the time series of $CaCO_3$ percentage as a climatic variable. All the spectra calculated for variation in $CaCO_3$ percentage over the past 700,000 years exhibit a dominating spectral peak corresponding to a cycle of 41,700 years (Model I) or 25,000 years (Model II). These climatic cycles have also been recorded by deep-sea sediments in the southern Indian Ocean (Hays, J.D., et al., 1976), and correspond to the cycles of obliquity and precession variation of the earth's axis respectively. It seems that an important factor in controlling long-term change of climate is the variation in the earth's orbital geometry.

AUTHOR: CHEN Youming [7115 0645 2494]
WANG Xiulan [3769 4423 5695]

ORG: Both of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Resolution Experiments of Several Kinds of Pre-cambrian Iron-bearing Rocks from Eastern Hebei Province and Wuyang County, Henan Province"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 132-143

EXCERPT FROM ENGLISH ABSTRACT: In order to provide the scientific basis for exploring rich iron deposits formed by weathering and leaching, the authors have carried out experiments in resolution of silica and iron from hornblende magnetite-quartzite, magnetite-bistagite and magnetite-pyroxenolite. The rock samples were collected from eastern Hebei and Wuyang, Henan.

By mixing distilled meteoric and seawater with sodium bicarbonate, potassium carbonate, oxatic acid, acetic acid and a buffer solution of potassium biphthalate, respectively, we prepared a solution of different pH values. The samples were ground into five grades (1.0 - 0.5 mm, 0.5 - 0.154 mm, 0.154 - 0.09 mm, 0.09 - 0.06 mm, < 0.06 mm). The weight of samples used for the experiments was 3-5 g. The time for resolution lasted 26 months (eastern Hebei) and 20 months (Wuyang, Henan).

[Continuation of DIZHI KEXUE No 2, 1981 pp 132-143]

The results obtained are helpful in explaining why the ancient weathering crust on Pre-cambrian iron-bearing rocks from Wuyang is so thick (more than 200 meters) and why there is no evidence on the ancient weathering crust on the Pre-cambrian iron-bearing rocks from eastern Hebei.

AUTHOR: SUN Huiwen [1327 1920 2429]
LIU Suhua [0491 4790 5478]

ORG: Both of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Preliminary Mathematical Model of Sedimentary Basin in the Southern Part of the Huanghua Depression"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 144-152

TEXT OF ENGLISH ABSTRACT: This paper deals with a quantitative mathematical model of a sedimentary basin. This model, in general, is suitable for simulating the deposition of clastic sediments. As an example we took a continental gypsum salt lake basin, an alluvial fan extended in the southern part of the Huanghua depression. The data obtained from five boreholes are shown in the simulated section. There we applied three kinds of sediments, i.e., sandstone and gritstone, mud stone, and argillaceous gypsum rock. Our model took the subsidence of the earth's crust into consideration, and the results show that the lithological changes there had a periodical character. Consequently, five regions can be classified according to their petrographical facies: region of sandstone and gritstone, alternating region of sandstone and gritstone with mud stone, region of mud stone, alternating region of mud stone with argillaceous gypsum rock and region of argillaceous gypsum rock. In addition, our model gives a quantitative illustration of the lithological

[Continuation of DIZHI KEXUE No 2, 1981 pp 144-152]

and petrographical changes, such as the periodic change of the amount of water at a different interval, the gradual change of flow speed in various parts, the grain size of sediments, etc. From this model can be seen an asynchronism of sedimentation with the subsidence of the earth's crust. Generally speaking, this sedimentary basin model in its present form can be used for making a wide variety of simple modeling tests on sedimentation.

AUTHOR: CHEN Qiying [7115 0366 5391]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Study on the Intraclast of Phosphorite"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 153-158

TEXT OF ENGLISH ABSTRACT: Intraclastic phosphorite is a common and important type of industrial ore. The composition, structure and distribution of the intraclasts of phosphorite have been studied. Because of the change of sedimentary environment, the original phosphorite has been subjected to disintegration, scouring and sorting before consolidation and, as a result, it has become anguclast of various sizes. It was deposited, cemented and consolidated in situ or by transporting at a short distance. This is a kind of phosphate intraclast formed within a mineralization basin. These processes might have been repeated many times throughout the intraclast formation process. The varieties of intraclast formed in geological processes can be distinguished according to their characteristic composition and structure, and then the environment of formation can be interpreted. According to the different geological processes, three types of phosphorite intraclast can be distinguished, i.e., tidal beach, syndepositional structure and scouring of bottom current of a marine basin.

AUTHOR: LI Binglun [2621 4426 0243]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Some Problems in the Study of Gas-Liquid Inclusion in Minerals"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 159-163

TEXT OF ENGLISH ABSTRACT: Based on the characteristics of inclusions in artificial minerals, the physical and chemical changes after their trapping, and the morphological and characteristic variations of inclusions in metamorphic processes, this article discusses the limited application of essential assumptions and genetic criteria in studying the gas-liquid inclusion of minerals. The results obtained indicate that some problems should be considered in the study of gas-liquid inclusion.

AUTHOR: SHAN Lin [0830 2651]
ZHANG Wenzhi [1728 2429 2535]

ORG: SHAN of Fuzhou Geological College, Jiangxi Province; ZHANG of Laboratory No 207

TITLE: "The Characteristics of the Fusion-inclusions and the Method Measuring for Temperature"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 164-170

TEXT OF ENGLISH ABSTRACT: The fusion-inclusions were formed as minerals being locked after catching silicate magma in the process of its crystallization. The fusion-inclusions differ from gas-aqueous inclusions in form, characteristics of gas bubbles and solid products, and the change in the heating and cooling processes. The quenching method by quartz-glass tubes was used to determine the formation temperature of granite, monzonite and rhyolite. The results of the determination agree well with those published in earlier literature: granite, 850-900°C; monzonite, 1050-1100°C; rhyolite, 1200-1250°C.

AUTHOR: ZHANG Zhaozhong [1728 0340 1813]

ORG: Institute of Geology, National Bureau of Seismology, Beijing

TITLE: "The Zonal Texture of Orthoclase in Alkaline Rock from Yaoan County, Yunnan Province"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 171-175

TEXT OF ENGLISH ABSTRACT: In the augite biotite syenite-porphyry from Yaoan County, Yunnan Province, the zonal texture of orthoclase phenocrysts and their polysynthetically twined and lamellar crystals are well developed. The number of zones in a single crystal may amount to 15-20. The zone form is identical to that of the corresponding crystal face. However, the width of zones varies with the crystal face indices. In general, the zones parallel to $\{001\}$ and $\{010\}$ are narrow and dense, and those parallel to $\{20\bar{1}\}$ and $\{110\}$ are broader, while those parallel to $\{100\}$ are the broadest. From the innermost zone outward the optic angles 2V gradually increase. The composition of the inner zone is $Or_{75}Ab_{25}$, and that of the outer zone is $Or_{60}Ab_{40}$. The refractive indices are $N_g = 1.530$, $N_m = 1.527$, $\triangle_d\ (131) - (1\bar{3}1) = 0$.

AUTHOR: HUANG Xuan [7806 5503]
PAN Jun [3382 0971]
ZHANG Renhu [1728 0117 4375]
SUN Baoshan [1327 1405 1472]

ORG: All of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Study of the Small Column Chemical Procedure for the Dilution Determination of the Rubidium and Strontium Isotopes in Natural Silicate Rocks"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 176-183

TEXT OF ENGLISH ABSTRACT: The chemical procedure described in this paper was designed to meet two requirements: (a) it should be applicable to various kinds of natural silicate rocks, and (b) it should ensure the separation and purification of rubidium and strontium in a single run of ion exchange procedures.

Samples are dissolved in mixed $HF\text{-}HClO_4$ acid, and then heated to decompose perchlorites of Fe, Al and Mg into oxides which are subsequently removed by centrifugal separation after adding about 5 ml of deionized water to the solution and boiling it. The use of this procedure will considerably simplify the composition of the ion exchange solution and, in addition, will greatly increase the ratio of the total volume of cation exchange to the total content of cations in the equilibrium system, hence facilitating the process of ion separation.

[Continuation of DIZHI KEXUE No 2, 1981 pp 176-183]

We used 0.3 N HCl, 0.5 N HCl mixed with 0.2 M oxalic acid, and 1.25 N HCl to rinse away ions of alkali elements Fe and Al and alkaline earth elements, respectively, resulting in good separations among Na-K-Rb, Mg-Ca-Sr, and Rb-Mg, Rb-Sr and Al-Sr, respectively.

This procedure was proved successful by more than 300 analyses of samples of granites to mafic rocks and olivine.

AUTHOR: PAN Shulan [3382 2562 5695]
SHAO Maorong [6730 5399 5422]
HAI Chaozhen [3189 3390 3791]
et al.

ORG: All of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "The Method for Preparing SO_2 for Isotope Analysis from $BaSO_4$ by Thermal Decomposition"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 184-189

TEXT OF ENGLISH ABSTRACT: This paper describes our experiments carried out for direct decomposition of $BaSO_4$ in order to get SO_2. By using this method, we have analyzed more than 100 samples of $BaSO_4$. The yield of SO_2 on the average is 99 percent with a standard deviation of ± 1 percent. In addition, a series of sulfides was transformed into sulfates by mixing it with Eschka mixture, resulting in $BaSO_4$ precipitation. This procedure promised a uniformity of O^{18} abundance in SO_2. The difference in $\delta^{34}S$ between CuO-combustion method and thermodecomposition of $BaSO_4$ is in the range of 0.02 percent. Our determination results of LTB-1 and LTB-2 show its close agreement with those obtained in other laboratories, and have a standard deviation of 0.01 - 0.02 percent.

AUTHOR: LUO Shihua [5012 0013 5478]
YANG Ruiying [2799 3843 3841]
ZHANG Jinglie [1728 2529 3525]
et al.

ORG: All of the Institute of High Energy Physics, Chinese Academy of Sciences, Beijing

TITLE: "Instrumental Neutron-activated Analysis of Scandium and 10 Other Elements in Vanadium-Titanomagnetite"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 190-194

TEXT OF ENGLISH ABSTRACT: Using the instrumental neutron-activated method the authors have explored a preliminary approach to the analysis of scandium and 10 other elements in vanadium-titanomagnetite. Having analyzed five samples of titanomagnetite we obtained the contents of the elements mentioned above in these samples, and then discuss the accuracy and precision of our method.

AUTHOR: ZHANG Peishan [1728 1014 0810]
TAO Kejie [7118 0344 2212]

ORG: Both of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Zhonghuacerite $Ba_2Ce(CO_3)_3F$--A New Mineral"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 2, 1981 pp 195-196

EXCERPTS FROM ENGLISH ABSTRACT: Recently a new mineral was discovered and identified as a member of the barium rare-earth fluor-carbonate mineral series. It is extremely fine grained. The aggregated mineral composed of grains is granular. Its aggregate is pale yellowish in color with a light yellowish streak (powder). There is no cleavage; even in the fine aggregate the cleavage may not show. The luster is vitreous or greasy and translucent, its microhardness is measured as 289-309 kg/mm^2 and the Mohs hardness is approximately 4.6. Because of its locality and chemical composition we named it Zhonghuacerite $Ba_2Ce(CO_3)_3F$.

The electron diffraction pattern and X-ray energy spectrum of Zhonghuacerite are quite different from those of similar minerals, such as cordylite, huanghoite and cebaite, and have their own characteristics. Zhonghuacerite is quite different from huanghoite and cebaite in the differential thermal curves, for example, its first big endothermic effect appears near 645°C (decomposition of CO_2), and not at

[Continuation of DIZHI KEXUE No 2, 1981 pp 195-196]

680-690°C as do the last two, whereas the second big endothermic effect of the three minerals is the same, all at 800°C ($BaCO_3$ decomposed).

Zhonghuacerite was found in Proterozoic metamorphic dolomite from Bayan Obo in north China, and is associated with cebaite, ferro-dolomite phlogopite, riebeckite, magnetite and quartz, etc. The type specimens are preserved in the Museum of Geology, Beijing.

9717
CSO: 4009/307

END

JPRS 78855

28 August 1981

China Report

SCIENCE AND TECHNOLOGY

No. 122

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78855

28 August 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 122

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Oceanographic Survey Ship Launched
(SHAANXI RIBAO, 20 Jul 81).. 1

APPLIED SCIENCES

Nanjing Fiber Optic Communications Line Tested
(DIANLI JISHU, 5 Apr 81).. 2

Paper on Recoverable Earth-Oriented Technology Satellites
(Yang Jiachi, et al.; YUHANG XUEBAO, Jan 81).................... 9

Briefs
Large Capacity Desalination Complex 30

ABSTRACTS

CEMENT PRODUCTION

SHUINI [CEMENT], No 7, 1981.. 31

CONSTRUCTION

JIANZHU [BUILDING CONSTRUCTION], No 6, 30 Jun 81........................ 32

ELECTRIC POWER

DIANLI JISHU [ELECTRIC POWER], No 6, 5 Jun 81.......................... 34

ELECTRONICS

DIANSHIJIE [ELECTRICAL WORLD], No 6, 1981.............................. 36

MEDICAL RESEARCH

YICHUAN [HEREDITAS], No 4, Jul 81.. 37

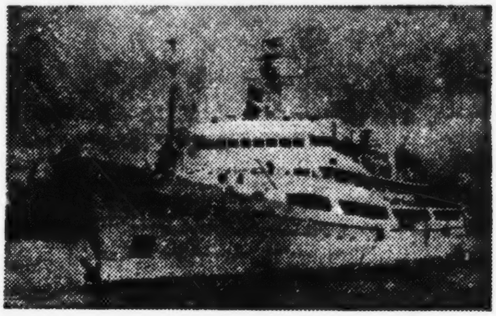
RESEARCH

XIANDAIHUA [MODERNIZATION], No 7, 16 Jul 81.......................... 39

OCEANOGRAPHIC SURVEY SHIP LAUNCHED

Xian SHAANXI RIBAO in Chinese 20 Jul 81 p 4

[Text] The Chinese designed and built marine geophysics survey ship, "the Kexue No 1", was recently delivered for trial voyage by the Chinese Academy of Sciences Oceanography Institute and will conduct a multidisciplinary survey in the East China Sea. "The Kexue No 1" survey ship was built by the Hudong Shipyard in Shanghai and is equipped with imported advanced satellite navigation, position finding and seismologic equipment. It can conduct studies in marine geophysics, marine geology, hydrology, meteorology, chemistry and biology.



"The Kexue No 1" survey ship leaving port.

CSO: 4008/452

NANJING FIBER OPTIC COMMUNICATIONS LINE TESTED

Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 4, 5 Apr 81 pp 34-36

[Article by the Communications Research Laboratory of the Nanjing Automation Institute: "Nanjing Fiber Optic Communications Test Line"]

[Text] I. General Situation

Fiber optic communications is a new type of communications method that has emerged in the field of communications. It has a large communications capacity, strong resistance against electromagnetic interference, small transmission loss, it is convenient to install, and it can save a large amount of ferrous metals. In recent years, it has been noticed by the advanced nations. According to reports, there are at least several hundred organizations in the world engaged in fiber optic communications. At present, fiber optic communications technology has already stepped out of the laboratory and has entered into the phase of comprehensive testing. There are over 100 fiber optic communications lines in the world now being tested and operated. Our nation's fiber optic communications research began relatively late but progress has been fast. At present, our nation's postal and telcommunications and railroad departments have established testing of fiber optic communications. Becuase optical fibers can insulate themselves from electromagnetism, the superiority of fiber optic communications is more visible in applications in electric power systems. Some nations have first applied fiber optic communications in electric power systems, and even wrapped fiber optic cables with electric power cables to transmit various kinds of control information.

To utilize fiber optic communications in our nation's electric power system, the Nanjing Automation Institute of the Ministry of Electric Power established a fiber optic communications staff at the end of 1977 and began to study the application of fiber optics in electric power systems. In November, 1978, the laboratory used a 20-meter optical fiber to transmit television images. In 1979, an optical terminal was developed for the fiber optic communications test line from the Nanjing Power Supply Bureau to the Midtown Transformer Staton and the technical problems of optical fiber coupling was solved. On 1 October of the same year, a 500-meter optical fiber was used in the laboratory to transmit television images and PCM pulse coded messages. In December, the laboratory again used a 1.8-kilometer optical cable to transmit analog television images and telephone communications. In January of 1980 under the cooperation of the Nanjing Power Supply Bureau, the first fiber optic communications test line of the electric power system was established from the Nanjing Power Supply Bureau to the Midtown Transformer Station. It successfully transmitted dispatched telephone communications, telemechanic signals and television images.

This experimental line is 1.8 kilometers long, 600 meters of the line are supported on the same pole as a 10 kilovolt high voltage power line. The optical cable hangs on a fixed iron line and is strung along the iron line at varying distances in between with large gaps of 50 meters and small gaps of 30 meters. This is our nation's first suspended optical cable test line.

The Nanjing Power Supply Bureau was in charge of setting up this optical cable. Because the optical cable has fixed connections, therefore during installation, the positions of the fixed connections were determined first then the cable was installed from the center outward in two directions. To prevent too much pull on the optical cable, during installation, a guide pulley was hung on each pole and at corners. The weight of the optical cable was lighter than electrical cable, installation was convenient, and this optical cable was completely installed within one day.

The components used by this test line were all domestically produced. The optical cable was provided by the Shanghai Electrical Cable Institute and the Shanghai Xinhu Glass Plant. The emitting diode was provided by the Shanghai Metallurgical Institute of the Chinese Academy of Sciences and the 519 Plant of the Postal and Telecommunications Ministry. The PIN probe was provided by the 519 Plant of the Ministry of Posts and Telecommunications.

II. Major Performance Indicators

1. Transmission distance. A distance of 1.8 kilometers (consisting of two optical cables of 960 meters and 840 meters long connected by a fixed connection).

2. Optical cable. The optical cable has four core optical fibers, (multiple mode grdient type, diameter of 60/150 micrometers), one pair of power lines of 0.5 millimeter in diameter, one fortification core.

3. Optical cable loss

(1) The Shanghai Electrical Cable Institute measured the loss with a direct current light signal through a bypass (stable condition) under a room temperature of +18° C, the values are listed in Table 1.

Table 1

光纤序号 1 损 2 耗 光注入端 3	1	2	3	4
A—B	3.27	3.07	2.87	4.12
B—A	2.97	3.6	3.13	4.81

注：A—B端是指光从960米段光缆通向840米段光缆。
4 B—A端是指光从840米段光缆通向960米段光缆。

Key:
1. Number of optical fiber
2. Loss
3. Light signal input end
4. Note: A-B refers to the light signal entering the 960-meter segment and traveling towards the 840-meter segment.
   B-A refers to the light signal entering the 840-meter segment and traveling towards the 960-meter segment.

(2) The loss was used to test the line and then an LED light source was used to measure the loss without going through the bypass (unstable condition), the values are listed in Table 2.

Table 2

1 光纤序号	2 光注入端	3 直流光衰耗（分贝/公里）	4 交流光衰耗（分贝/公里）
1	A—B	8.33	4.44
2	B—A	8.33	4.44
3	A—B	5.27	4.22

5 注：4号光纤作为备用，没有测试。

Key:
1. Number of optical fiber
2. Light input end
3. Direct current light loss (decibel/kilometer)
4. Alternating current light loss (decibel/kilometer)
5. Note: No 4 optical fiber served as backup and was not tested.

4. Method of Regulation

Simulated signals were used directly for regulation.

5. Information Transmission

(1) A single channel black and white television image, frequency band width of 0 - 8 megahertz.

(2) Transmitting 250 baud telemechanically, there were remote test signals, remote communications signals and remote control signals.

(3) Transmitting carrier wave telephone communication, carrier wave frequency was 272 - 276 kilohertz and 352 - 356 kilohertz.

6. Optical terminal and electrical terminal interface

Input, output range: 1 $V_{peak - peak}$

Input, output impedance: 75 ohms (not balanced).

7. Optical output terminal

Light source: LED gallium arsenide diisomer luminous diode.

Optical wavelength: 0.83 micrometers.

Method of connection with the optical cable: There is a movable connector and there is also a fixed connection.

The power of alternating light of the output (including optical fiber output) light power transmission of television image was 39.8 microwatts (-14 milliwatt decibel), the power of alternating light for telephone transmission was 0.933 microwatt (-30.3 milliwatt decibel).

8. Light input terminal

Probe: PIN silicon photoelectric diode, photoelectric conversion efficiency of 0.4 microampere/microwatt, lowest receiving electrical potential of -38 milliwatt decibel, response rate $<$ 5 millimicroseconds.

Method of connection with the optical cable: Fixed connection.

Sensitivity of optical receiver: The power of alternating light for reception of television image was 0.31 microwatt (-35 milliwatt decibel), the power of alternating light for telemechanic reception of telephone communication was 0.11 microwatt (-39.23 milliwatt decibel).

9. Power source

Input voltage: -- 220 volts.

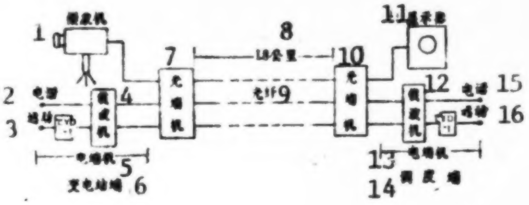
Output voltage: ±12 volts, ±6 volts.

Power loss: about 5 watts.

III. Telemechanic Principles of Transmitting Television Images and Telephone Communications

The transmission system (see diagram below) of this fiber optic communications test line uses the analog type. The analog electrical signal directly regulates the LED emitting diode for photoelectric conversion into light signals. The advantage of this type of transmission of light waves through the light guiding fiber is that the equipment is simple and reliable, it can be conveniently connected to the presently available communications equipment of the electric power system (the communications equipment used in our nation's electric power system is mostly analog).

Illustration of the fiber optic communications transmission system



Key:

1. Camera
2. Telephone
3. Telemechanic device
4. Carrier wave generator
5. Electrical terminal
6. Transformer station terminal
7. Optical terminal
8. 1.8 kilometers
9. Optical fiber
10. Optical terminal
11. Display screen
12. Carrier wave generator
13. Electrical terminal
14. Regulator terminal
15. Telephone
16. Telemechanic device

This test line transmits television images using a fixed focal distance and a single camera installed at the transformer station. A 19-inch color television is converted to serve as a display screen installed at the regulator terminal forming a monitoring system. It can monitor the operation of the high voltage switch, the transformer and other equipment in the transformer station, and the personnel on duty in the main control room.

Transmission of telephone communications and telemechanic signals uses the ZZD-5 model electrically powered carrier wave generator, the TSY-2 model digital telemechanic device and the JYD-1 model sound frequency channel equipment connected all together forming a remote regulatory telephonic monitoring system with 20-point remote control, 28-point remote signaling, 28-point remote testing of signals.

In the entire fiber optic communications transmission system, the television image, the telephone and telemechanic transmission are transmitted via different optical fibers in a single optical cable. One optical fiber transmits the television image signals, the second optical fiber transmits telephone and telemechanic signals. In this way, one optical fiber corresponds to one light source and one optical probe, therefore on the optical terminal at the transformer station are installed two light emission dishes and one light receiving dish. One is used to send television images, the other is used to send telephone and telemechanic signals. On the regulator terminal's optical terminal is installed a light emission dish and two light receiving dishes. The emitting dish is used to transmit telephone and telemechanic signals. The ZDD-5 model electrically powered carrier wave generator can be used for repeated telemechanic transmission, the telephone and the telemechanic signals use the same optical fiber for transmission. Here, the ZDD-5 model electrically powered carrier wave generator must be changed to four high frequency lines to separate reception and transmission. Transmission to the opposite terminal is realized via the transmission brnach channel of the carrier wave generator through the alternator which is connected to the optical terminal's transmission dish by converting the electrical signal to a light signal and sending it into the optical fiber. The telephone and telemechanic light signals transmitted via the other optical fiber enter the light receiving dish of the optical terminal and the light signals of the telephone and telemechanic transmission are converted to electrical signals and sent to the signal receiving branch channel of the carrier wave generator, thus forming a channel for the transmission of telephone and telemechanic signals.

IV. Results of Establishing the Fiber Optic Communications Test Line

1. The fiber optic communications test line has transmitted television images and telephone and telemechanic information. The test results show that the television image is clear, the sound of telephone transmission is clear, and telemechanic signals are accurate and reliable. The dispatcher can view the main transformer in the Midtown transformer station directly on the television screen in the dispatcher room, the state of the switches and the personnel on duty. The results of using fiber optic communications to transmit regulatory commands and to carry out remote testing, remote signaling and remote control are good.

2. By testing the line, we proved that fiber optic communications can resist strong electromagnetic interference. This optical cable was set up on the same pole with a 10 kilovolt high voltage power line. The efficiency value of the power frequency sensitive voltage (cable - ground voltage) on the dynamic curve measured in the optical cable (ϕ 0.5 millimeter copper wire) was 16 volts while the fiber optic communications did not receive any interference.

3. Optical fibers are insulating materials, they are not affected by electromagnetic fields. Optical cables set up on the same pole with high voltage power lines can be directly installed into the dispatcher station and the transformer station or the carrier wave generator room of the power plant without the need for damping devices, coupled capacitors, connecting wave filters, and this saves investment and improves reliability of communications.

4. Through testing, we further grasped the variation of attenuation in the domestically produced optical equipment and optical cables. We discovered tha the output light power of the LED emitting diode dropped more, and using the same light power meter for measurements, we found that when the test line was first installed, the measured driving electrical current was 90 millamperes, the output light power was 49 microwatts, after half a year, the measured driving electrical current was 90 millamperes, the output light power was 37.5 microwatts. The attenuation in the optical cable of the test line varied minutely with changes in weather and temperature.

5. We also utilized the test line to perform the following tests:

(1) We used the error code rate tester to transmit AMI codes and HDB_3 codes of the PCM pulse code messages and measured an error code rate of less than 10^{-9}.

(2) We used two optical fibers connected together and successfully transmitted television images via 3.6 kilometers.

6. The test line shows the operation of the optical terminal is reliable, and operation is simple. At the time, the transformer station was undergoing expansion and construction was being carried out, there was a lot of dust, but the optical terminal could adapt to the relatively poor working environment, it was switched on and off frequently and it did not need readjustment and it could operate normally.

7. After completion of this fiber optic communications test line, many tentative ideas by communications workers of the electrical pwoer system have emerged: The use of fiber optic communications has a large capacity, the resistance to interference is strong, and installing optical cables on the same pole as power lines or on suspended ground power lines can solve the problem of transmitting telemechanic information from the transformer station and the communications center station (switchboard) and dispatching telephone calls into urban areas at once.

9296
CSO: 4008/416

PAPER ON RECOVERABLE EARTH-ORIENTED TECHNOLOGY SATELLITES

Beijing YUHANG XUEBAO [JOURNAL OF THE CHINESE SOCIETY OF ASTRONAUTICS] in Chinese No 1, Jan 81 pp 1-13

[Article by Yang Jiachi [2799 0857 1062], Zhang Guofu [1728 0948 1381], Sun Chengqi [1327 2110 0796], Feng Xueyi [7458 1331 5030], and Niu Yinsheng [6873 1377 3932]

I Introduction

The first generation three-axis stabilized attitude control system was used on China's recoverable earth-oriented technology satellites and successfully completed its design missions, which are: 1) to eliminate the initial attitude bias caused by separation of the carrier vehicle and the satellite; 2) to meet the precision requirements of satellite attitude and angular velocity during orbit; and 3) to allow rapid changes of satellite attitude about the pitch axis for re-entry.

In this paper, the composition and main function of the attitude control system are introduced and considerations for selecting the key system parameters are discussed. In addition, an analysis of the flight test results is also presented.

II Description of the Attitude Control System and Considerations for Selecting the Key System Parameters

The attitude control system is closed-loop system composed of the attitude sensing system, the control circuit, and the jet-powered execution mechanism on the satellite. The attitude motion is expressed in terms of the earth-centered orbit coordinate system and the satellite body coordinate system, as shown in Fig. 1. The angles between the two systems are called roll angle, pitch angle, and yaw angle and are denoted by ϕ, θ, ψ respectively.

1. Attitude Sensing System

In order to establish the earth-centered orbit coordinate system as a reference for attitude sensing and for bias measurement, and also to meet the requirements of eliminating initial attitude bias and establishing re-entry attitude, we have used an attitude sensing system which consists of two conical scan infrared horizon sensors and two two-degree-of freedom gyroscopes, as shown in Fig. 2. In designing the optical system and electronic circuit of the horizon sensor, measures were taken to improve the sensor performance. In particular, we took advantage of the complimentary characteristics between the infrared horizon sensor and the gyroscope: the gyroscope output has relatively small high-frequency noise but exhibits a constant drift, consequently it cannot be used as a long-term reference source; the infrared horizon sensor on the other hand is well suited as a long-term reference because of its small drift, but it has a high noise level and cannot serve as a reference for measuring attitude bias. By combining the merits of both sensing devices one can achieve an improved attitude sensing system.

Figure 1. Relationship Between Two Coordinate Systems
Earth Centered Orbit Coordinate System- OXYZ
Satellite Body Coordinate System - oxyz

key: 1. center of earth
2. satellite
3. orbit plane

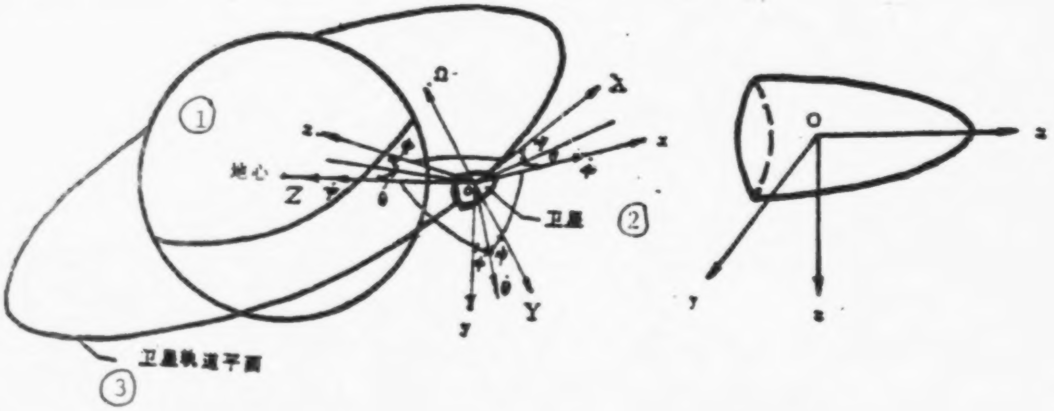
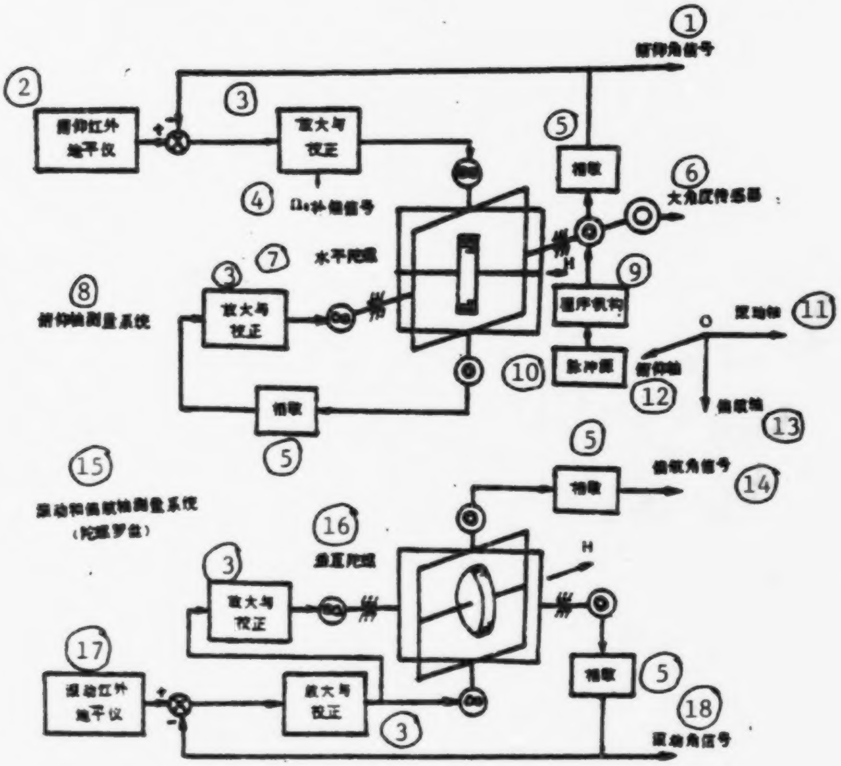


Figure 2. Composition of the Attitude Sensing System
◉ - sensing device ⊖ - torque device

key: 1. pitch angle signal
2. pitch infrared horizon sensor
3. amplification and correction
4. compensation signal
5. phase sensitive
6. large angle sensor
7. horizontal gyroscope
8. pitch axis sensing system

Figure 2 (continued)

9. programmed mechanism
10. pulse generator
11. roll axis
12. pitch axis
13. yaw axis
14. yaw angle signal
15. roll and yaw axes sensing system (gyrocompass)
16. vertical gyroscope
17. roll infrared horizon sensor
18. roll angle signal


①
俯仰角信号
②
俯仰红外地平仪
③
放大与校正
④
Ωe补偿信号
⑤
⑥
大角度传感器
⑦
水平陀螺
⑧
俯仰轴测量系统
⑨
程序机构
⑩
脉冲器
H
O
⑪
滚动轴
⑫
俯仰轴
⑬
偏航轴
⑭
偏航角信号
⑮
滚动和偏航轴测量系统
（陀螺罗盘）
⑯
垂直陀螺
⑰
滚动红外地平仪
⑱
滚动角信号

It can be seen from Fig 2 that the long-term sensing reference is provided by the infrared horizon sensor; the short-term or transient sensing reference is provided by the gyroscope, which also generates the relatively smooth attitude bias signals for all three channels. Specifically, the pitch bias signal is generated by the pitch infrared horizon sensor and the horizontal gyroscope; the yaw and roll bias signals are generated by the gyrocompass which consists of the roll infrared horizon sensor and the vertical gyroscope. The programmed mechanism located on the outer gimbal of the horizontal gyroscope is used to provide programmed bias signals during re-entry, and the large angle sensor is used to monitor the operation of the attitude control system during re-entry. During the phase of initial bias elimination and the re-entry phase, the infrared horizon sensor must be cut off from the sensing system so that the system is basically open-loop, with both gyroscopes operating in a free state. Fig 2 represents the operating condition of the sensing system during normal orbit phase.

When the orbit is near circular, the signal is sufficiently small to be operating in a linear region, and Fig 2 can be represented by a simplified block diagram, as shown in Fig 3. From Fig 3 the following equations can be written:

$$\frac{d}{dt}(\theta_G-\theta)=K_\theta(\theta_H-\theta_G)+\Omega_0-\Omega+D_2 \tag{1}$$

$$\frac{d}{dt}(\psi_G-\psi)+\Omega(\phi_G-\phi)=K_\psi(\phi_H-\phi_G)+D_3 \tag{2}$$

$$\frac{d}{dt}(\phi_G-\phi)-\Omega(\psi_G-\psi)=K_\phi(\phi_H-\phi_G)+D_1 \tag{3}$$

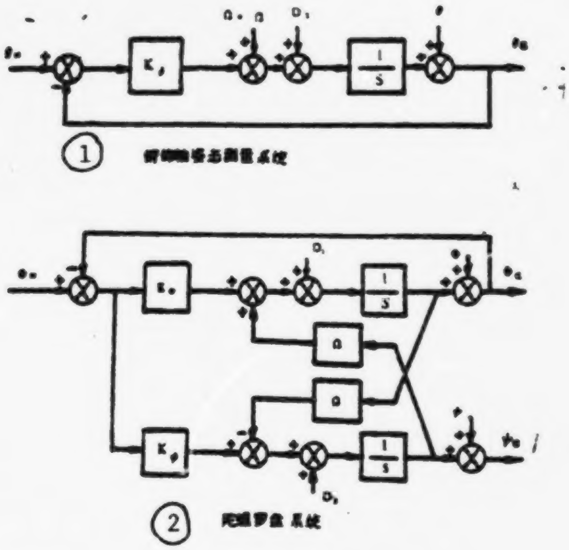
where θ , ψ , and φ are respectively the pitch, yaw, and roll angle of the satellite. θ_G , ψ_G, and φ_G are respectively the pitch, yaw, and roll gimbal angle of the gyroscope. K_θ, K_ψ , and K_φ are the amplification factors of the gyroscope precession angle provided by the amplifier and the gyroscope torque device. D_1, D_2 and D_3 are the effective drift rates of the gyroscope along the roll, pitch, and yaw axes, which include gyroscopic drift, components of the precessional velocity of the orbital plane along the three axes, and second-order coupling effects, etc. Ω and Ω_0 are respectively the instantaneous and reference orbit angular velocities; the latter is provided by the amplifier.

Both Fig 3 and equations (1), (2), and (3) indicate that the key parameters here are K_θ , K_ψ , and K_φ . In principle they should be chosen to achieve a compromise between the noise level of the horizon sensor and the corresponding gyroscopic drift, so that the mean square value of attitude sensing error is minimized; also, the effect on gas consumption due to noise in the intermediate circuits should be considered. This is particularly important for lower orbit satellites whose infrared horizon sensors cannot operate in the ideal

14-16 micron band. In the design of this system, we selected the three parameters based on the following conditions: maximum gyroscope drift 4 degrees per hour, root mean square error in the horizon sensor 0.25 degrees, and stable noise whose bandwidth is equal to 1000 times the orbit angular velocity.

Figure 3 Simplified Block Diagram of the Attitude Sensing System

key: 1. pitch axis attitude sensing ayatem
2. gyrocompass system



In addition, the following problems are also addressed in the design:

(1) Limiting the Maximum Precessional Velocity of the Gyroscope

In order to avoid increase in attitude bias and excessive gas consumption caused by the large output signal when the horizon scans toward the sun or the moon, the magnitudes of K_θ, K_ψ, and K_φ should be limited. In this design we impose the following limits:

gyroscope saturated precession velocity in the pitch axis ≤ 0.06 °/s
gyroscope saturated precession velocity in the yaw axis ≤ 0.054 °/s
gyroscope saturated precession velocity in the roll axis ≤ 0.018 °/s

(2) The Problem of Matching Transfer Coefficients Between the Infrared Horizon Sensor and the Gyroscope

During actual implementation, the transfer coefficient between the input angle and output voltage of the infrared horizon sensor, K_A, may differ from the transfer coefficient between the input angle and the tranducer output voltage of the gyroscope, K_g. Analysis and experiment show that when K_h and K_g are different, the system will operate on the limit cycle, resulting in increased gas consumption. This effect is particularly pronounced in the roll channel. For example, when K_h exceeds K_g by 10 %, stable "dual ejection phenomenon" will occur in the yaw-axis thrust system, and the angular velocity of the limit cycle and the gas consumption both increase by a factor of 2. In this design we impose the following requirements:

roll channel: $(K_h - K_g)/K_g \leqslant 6\%$
pitch and yaw channels: $(K_h - K_g)/K_g < 10\%$

(3) Selection of the Time Constant T_g for the Gyroscope Phase Sensitive Stage

Clearly, increasing T_g will reduce the damping of the system. If T_g reaches a certain value, the coordinated thrust operation of the system may be damaged. The dynamic characteristics of the pseudo-velocity gain feedback system require that T_g should be no larger than the charge constant T_{fc}. In general T_g should be less than 0.2 seconds.

(4) Time Constant of the Infrared Horizon Sensor T_h

Increasing T_h will cause an increase in the steady-state limit cycle velocity and gas consumption. Ideally T_h should be one order of magnitude smaller than the time constant of the tracking circuit. In general T_h should be less than 2 seconds.

2. Intermediate Control Circuit and Execution Mechanism

In order to achieve good system performance during three different phases of operation, an on-off type control and a cold-jet execution mechanism with two thrust levels were selected. This design was chosen primarily for its simplicity, reliability, light weight, and low power consumption. Fig 4 shows the block diagram of the pitch channel control system, and Fig 5 shows the composition of the execution mechanism.

Figure 4 Block Diagram of the Pitch Channel Attitude Control System
I = pitch axis moment of inertia
S = Laplace operator

key: 1. large thrust execution mechanism
2. perturbation
3. small thrust execution mechanism
4. attitude measurement

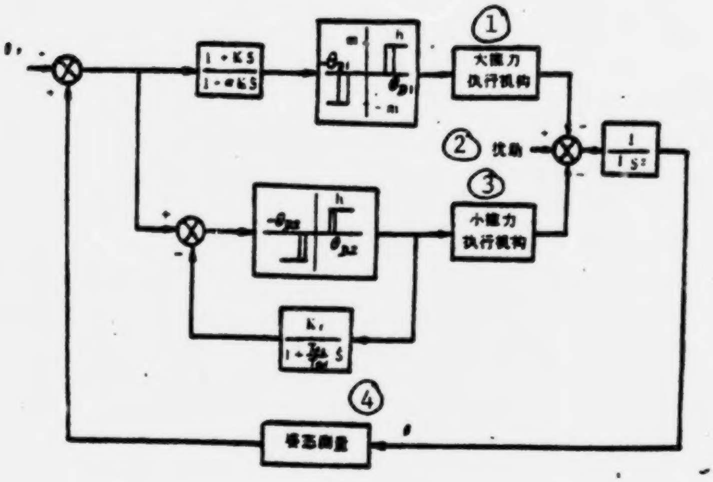
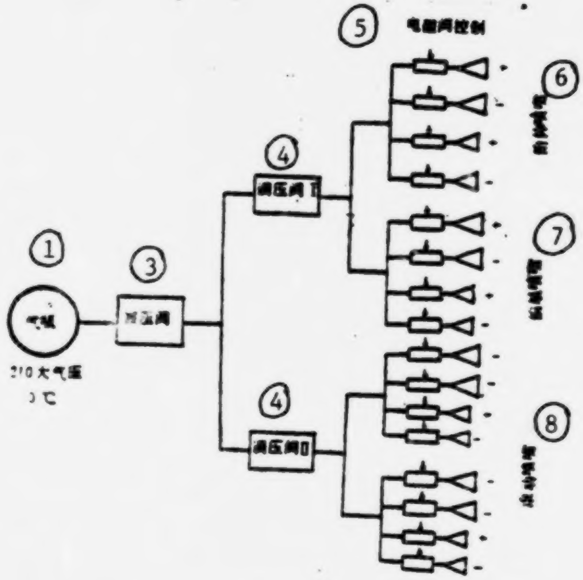

①
大推力执行机构
② 扰动
③
小推力执行机构
④
$\frac{1+KS}{1+\alpha KS}$
$\frac{1}{IS^2}$
h
m
-m

Fig 5 Composition Diagram of the Jet Execution Mechanism

key: 1. gas bottle
2. 210 atmosphere
3. pressure reduction valve
4. pressure regulator
5. solenoid control valve
6. pitch jet nozzle
7. yaw jet nozzle
8. roll jet nozzle


⑤
①
③
④
④
⑥
⑦
⑧
210大气压

For convenience, the pitch channel is used to illustrate the large and small thrust systems, and the satellite pitch angle is approximated by the output gimbal angle of the horizontal gyroscope.

(1) Large Thrust Pre-correction System

The large thrust pre-correction system is primarily used to eliminate the initial attitude bias and to establish re-entry attitude. In order to increase system damping, a pre-correction circuit is used. The main design requirement for the large thrust system is to eliminate initial attitude bias and to establish re-entry attitude with a minimum amount of gas consumption in the shortest time possible.

It is clear from Fig. 4 that if the dynamic effects of the execution mechanism and the time constant of the pre-correction circuit αK are neglected, the control response of the large thrust system can be described by the following equations:

$$m=-1,\ mA=-A,$$

$$\text{当}\ \theta+\theta_p+K(\dot{\theta}+\dot{\theta}_p)\geqslant\theta_D \quad (4)$$

$$m=+1, mA=+A,$$

$$\text{当}\ \theta+\theta_p+K(\dot{\theta}+\dot{\theta}_p)\leqslant-\theta_D \quad (5)$$

$$m=0,\ mA=0,\ \text{当}-(1-h)\theta_D\leqslant\theta$$
$$+\theta_p+K(\dot{\theta}+\dot{\theta}_p)\leqslant(1-h)\theta_D \quad (6)$$

$$\ddot{\theta}=A_d+mA=(M_d+mFl_j)/I \quad (7)$$

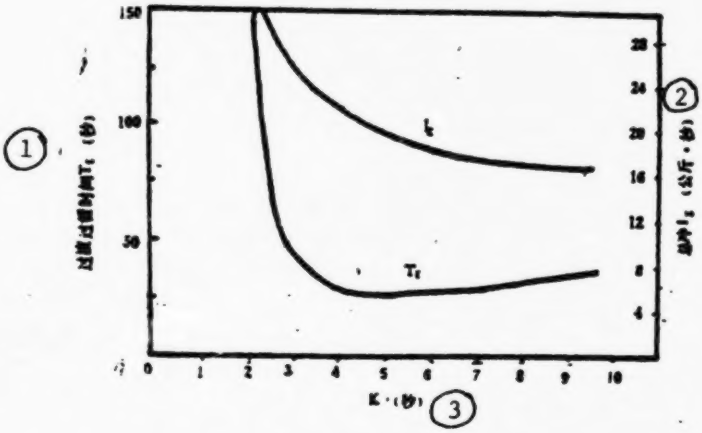
Here θ_p and $\dot{\theta}_p$ are respectively the programmed turn angle and angular velocity during re-entry. A_d and A are respectively the angular acceleration produced by the perturbation torque M_d and the control torque $F\ell_j$. F is the thrust force and ℓ_j is the moment arm. Clearly, during the initial bias elimination phase, both θ_p and $\dot{\theta}_p$ are zero. In actual implementation, equations (4)-(7) should be modified to account for the effects of the dynamics of the execution mechanism and the time constant αK. We shall now briefly discuss the problem of selecting the key parameters in the above equations.

i) selection of the parameter K of the pre-correction circuit

Under the simplified conditions described above, analytical or simulation methods can be used to determine graphically the variation of the transient process time T_t and the total impulse I_Σ as a function of the parameter K, as shown in Fig 6. T_t is the time required to eliminate a specified amount of initial bias. Given the specific impulse of a gas, one can compute the gas consumption Q based on the total impulse I_Σ. During the phase of re-entry attitude establishment, it refers to the time required to eliminate the remaining attitude bias and angular velocity after the pitch axis has made a turn of a specified angle θ_p. Fig 6 shows that when all other parameters are fixed, both T_t and I_Σ decrease with increasing K in a given range; but when K is greater than 4 seconds, T_t begins to increase. Therefore, the value $K \approx 4$ seconds is an appropriate choice.

Figure 6 Variation of the Transient Process Time T_t and total Impulse I_Σ with K

key: 1. transient process time T_t (seconds)
2. total impulse I_Σ (kg·seconds)
3. seconds



ii) selection of the switching dead zone θ_D and the damping cycle coefficient h

In order to conserve gas, the large thrust system is shut off whenever the attitude bias falls within ± 1°. Also, in order for the satellite pitch angle to reach $\theta_p \pm \varepsilon$ quickly (ε is the allowable error), the value of θ_D is chosen to be 1°. A large damping cycle coefficient h will improve noise suppression, but at the expense of system stability. A compromised value for h is h = 0.1.

iii) selection of the control angular acceleration A

The effects of A on T_t and I_Σ are shown in Fig 7 and Fig 8 respectively. It is seen that for $K = 3$-6 seconds, T_t and I_Σ no longer decrease with A when $A > 0.5$ °/s^2. When A is small, both T_t and I_Σ increase significantly. Therefore, $A = 0.5$ °/s^2 appears to be a good choice.

iv) selection of the programmed turn velocity

For simplicity, reliability, and ease of implementation, we selected a fixed turn velocity based on a compromise between T_R (time required to establish re-entry attitude) and gas consumption Q. Specifically, Q is minimized under the condition $T_R \leqslant 60$ seconds. In this design,

$\dot{\theta}_p$ is chosen to be $2.67 \times 10^{-2} \theta_p$ °/s.

Figure 7 Relationship Between Transient Process Time T_t and Control Angular Acceleration A

key: 1. seconds
2. degrees per second squared

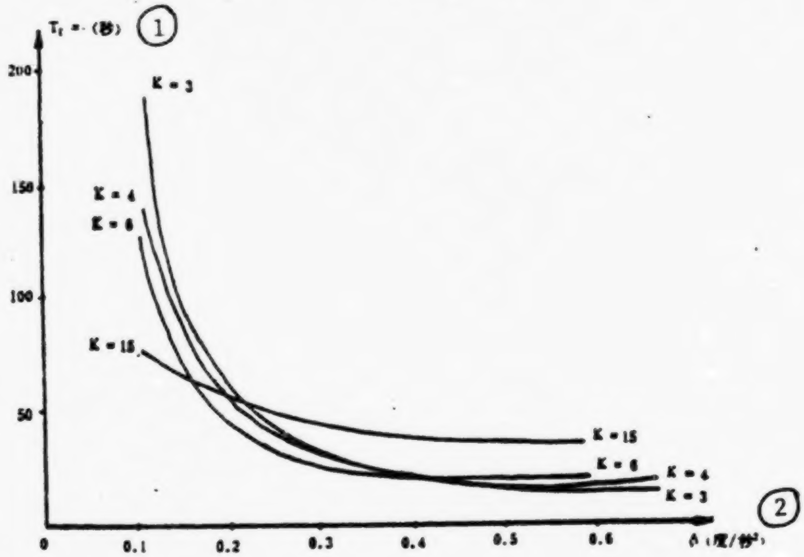
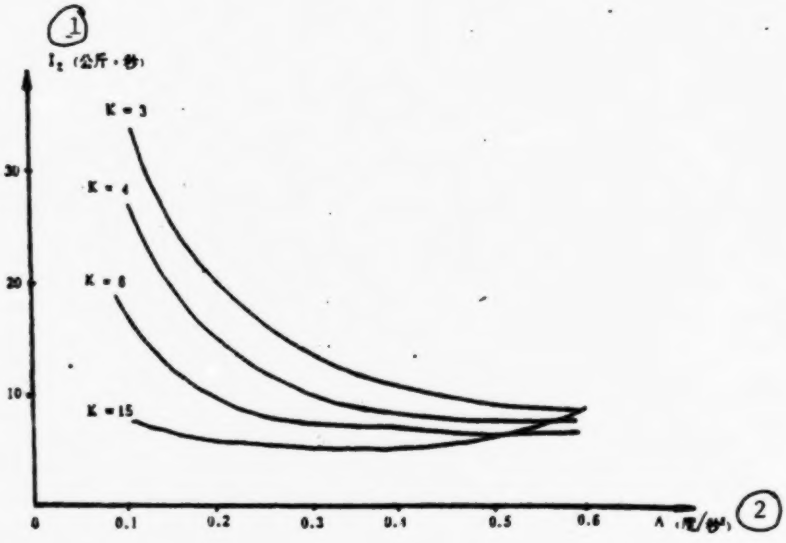


Figure 8 Relationship Between Total Impulse I_Σ and Control Angular Acceleration A

key: 1. kg·second
2. degrees per second squared



(2) Small Thrust System

The small thrust system is primarily used in the long-term orbit phase where high precision attitude control is required. In order to minimize gas consumption, to meet the precision requirements in attitude and angular velocity, and also to achieve good dynamic damping and long operating life, we used a pseudo-velocity gain feedback control system where the discharge time constant T_{fd} is larger than the charge time constant T_{fc}, as shown in Fig 4.

The pseudo-velocity gain feedback control system is a pulse modulation system. In the absence of perturbation torque, the system remains in the operating state of ideal limit cycle ① shown in Fig 9(A) (without special measure it is very difficult for the system to operate in the optimum state of limit cycle ③). The effective minimum thrust pulse width T_d of the system output is

$$T_d = T_{on} + \Delta T \qquad (8)$$

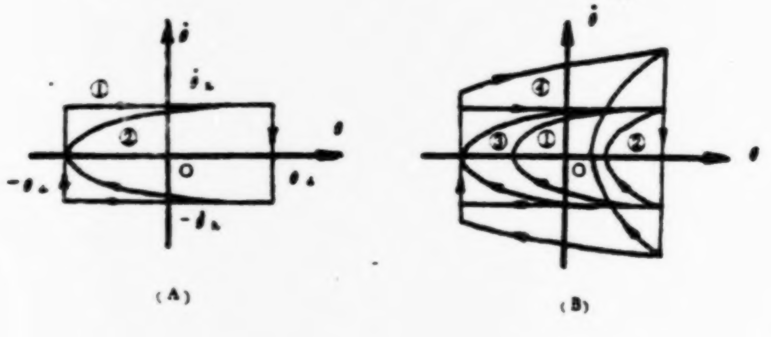
$$T_{on} = -T_{fc} \ln\left(1 - \frac{h\theta_d}{K_f a}\right) \qquad (9)$$

$$\Delta T = (T_{pd} - T_{pr}) + (T_{md} - T_{mr}) \qquad (10)$$

where T_{on} is the minimum pulse width of the pseudo-velocity gain controller, and ΔT is the increased pulse width after taking into account the thrust time delay, as given by equation (10). T_{pr} and T_{pd} are respectively the forward and backward time delays of the solenoid valve, T_{mr} and T_{md} are respectively the effective time constants of the forward and backward thrust. θ_d is the dead zone of the pseudo-velocity gain controller. In this case, the limit cycle angular velocity of the system is

$$\dot{\theta}_R = \frac{a}{2} T_d = -\frac{aT_{fc}}{2} \ln\left(1 - \frac{h\theta_d}{K_f a}\right) + \frac{a\Delta T}{2} \qquad (11)$$

Figure 9 Limit Cycle Operation of the Pseudo-Velocity Gain Feedback System



(A) (B)

For a given set of structural parameters and fixed specific impulse of the jet gas, we can define the angular velocity increment per unit time, denoted by q, as the key factor affecting gas consumption. Then under the condition of ideal limit cycle operation with no perturbation torque,

$$q=\frac{2a}{T}T_d=\frac{\dot{\theta}_R^2}{\theta_d}=\frac{f^2 l_j^2}{4I^2\theta_d}T_d^2 \tag{12}$$

Here α is the control angular acceleration produced by the small thrust force f, and T is the period of the limit cycle. It can be seen from equations (11) and (12) that in order to reduce $\dot{\theta}_R$ and q, T_d should be decreased, and Δ T should be made as small as possible. But in practice ΔT is generally greater than zero, hence T_d is in general larger than T_{on} .

When the system is subject to perturbation torque, it will be in an operating state denoted by the limit cycles ① and ② in Fig 9(B). Under most conditions it is difficult to be in the optimum state of limit cycle ③ . The curve ① represents the phase trajectory when the perturbation torque is less than the curve ② . Clearly, a small value of $\dot{\theta}_R$ will tend to form a one-sided jet. The larger the perturbation torque, the more frequently jet actions will take place. If the impulse torque ΔH_d on the satellite due to M_d is fixed, then in principle the gas expenditure required to overcome the perturbation torque is also fixed. If every jet action is used to overcome the perturbation torques, then the number of jet actions is given by:

$$\eta=\frac{\int M_d dt}{F l_i T_d}=\frac{\Delta H_d}{F l_i T_d} \tag{13}$$

It is clear from equation (13) that in the presence of perturbation torques, $\dot{\theta}_R$ or T_{on} should be properly increased in order to reduce the number of solenoid valve actions, and to prolong the life of the execution mechanism without increasing gas expenditure. It should be noted however that improper increase in T_{on} may result in the formation of two-sided jets (see curve ④ in Fig 9(B)) and reduced jet efficiency.

In the design of this system, the limit cycle velocity of the yaw channel, which has large perturbation torques, is chosen to be twice as large as that of the pitch channel or the roll channel which has smaller perturbation torques. A similar relation exists for the corresponding T_d. The selected values of $\dot{\theta}_R$ and T_d are summarized in Table 1.

Table 1 Selected Values for $\dot{\theta}_R$ and T_d

key: 1. parameter
2. channel
3. pitch and roll
4. yaw
5. limit cycle angular velocity $\dot{\theta}_R$
6. effective minimum thrust pulse width T_d

参 ① 数 ② 通 道	⑤ 极限环角速度$\dot{\theta}_R$	⑥ 等效的最小推力脉冲宽度T_d
③ 俯仰和滚动	2.5×10^{-3} °/s	50ms
④ 偏 航	5.0×10^{-3} °/s	100ms

Equation (11) shows that $\dot{\theta}_R$ is determined by a and T_d. The selection of $\dot{\theta}_R$ and T_d clearly will involve the selection of a. In this design the value of a is chosen to be 0.1 $°/s^2$, which is much larger than the angular acceleration produced by perturbation torques. This choice of a can be easily implemented and it ensures the coordinated operation between large and small thrust forces.

Furthermore, the values of T_{on} and ΔT can be properly allocated based on analysis and experimental results. In this design the allocation of T_{on} and ΔT is shown in Table 2.

Table 2 Allocation Of T_{on} and ΔT

key: 1. parameter
2. channel
3. pitch and roll
4. yaw

参 ① 数 ② 通 道	T'_{on}(ms)	ΔT(ms)
③ 俯仰和滚动	37	13
④ 偏 航	67	13

It is well known that in a pseudo-velocity gain feedback control system, when the attitude bias θ reaches a certain value θ_S, the system will be in a state of continuous jet action. The attitude bias which corresponds to the initiation of this state is called the "saturation jet angle," and is given by:

$$\theta_S = K_f a + (1-h)\theta_d \qquad (14)$$

It is an important parameter in ensuring coordinated large and small thrust operation. In this design, θ_S is chosen to be 0.6° - 0.75°, which takes into account the value of 1° for the large thrust switching dead zone θ_D.

In addition, if the dynamic characteristics of the execution mechanism and the sensor system are ignored, the system can be roughly treated as a second order linear system with damping ζ and natural frequency ω_n, which are given by:

$$\zeta = \sqrt{\frac{T_{fc} T_{fd}}{4K_f}} \tag{15}$$

$$\omega_n = \sqrt{\frac{T_{fc}}{T_{fd} K_f}} \tag{16}$$

Having presented the fundamental relations and data, we are now in a position to select some of the key parameters of the small thrust system.

i) selection of the switching characteristics

The dead zone θ_d should be matched with measurement error of the sensing system in order to meet the attitude precision requirement during the orbit phase. Furthermore, the dead zone of the small thrust system θ_d should be much smaller than that of the large thrust system θ_p to ensure that the primary operation during the orbit phase is provided by the small thrust system. We chose $\theta_d = 0.3^\circ$.

The damping cycle coefficient h not only affects T_{on} but also affects the noise suppression capability of the system. Equation (9) shows that when all other parameters are fixed, the smaller h is, the smaller T_{on} becomes, and the weaker is the noise suppression capability. On the basis of simulation and experimental results, a compromised value of h is chosen to be 0.1.

ii) selection of the feedback circuit parameters

In order to ensure coordinated operation of the large and small thrust system, θ_s is chosen to be 0.7°; it follows from equation (4) that $K_f = 4.3$ seconds^2.

By requiring that the pulse width T_{on} is minimum, one can compute the charge time constant T_{fc} from equation (9).

In order to require large dynamic damping in the system, the discharge time constant T_{fd} can be determined from equation (15). In this design we chose $\zeta = 1$.

The selected values for T_{fc} and T_{fd} are shown in Table 3.

On the basis of the selected key parameter values, one can easily deduce requirements on the thrust level of the execution mechanism and its dynamic characteristics. The nominal values of the large and small thrust levels for each channel are presented in Table 4.

Table 3 Selected Values For T_{fc} and T_{fd}

key: 1. parameter
2. charge time constant
3. discharge time constant
4. channel
5. milliseconds
6. seconds
7. pitch and roll
8. yaw

参① 数 ④ 通 道	②充电时间常数 T_{fc}（毫秒）⑤	放电时间常数 T_{fd}（秒）⑥
⑦ 俯仰和滚动	510	30
⑧ 偏 航	900	30

Table 4 Nominal Thrust Values For Each Channel

key: 1. type
2. large thrust (g)
3. small thrust (g)
4. channel
5. pitch
6. yaw
7. roll

① 种 类 ④ 通 道	② 大推力（克）	③ 小推力（克）
⑤ 俯 仰	1000	200
⑥ 偏 航	1000	200
⑦ 滚 动	350	70

During the initial design of the system, a large number of mathematical simulations were performed. After the first prototype was developed, the system design was verified using semi-empirical and empirical methods; furthermore, studies were conducted on the coordinated operation of large and small thrust system for each channel and the coupling effects between the three axes. On the basis of these results regular product development was initiated, and interface requirements with respect to the overall system and other subsystems were established. To meet the reliability requirement in space, a large amount of analyses and experimental work were performed during regular product development. However, due to limited space they will not be discussed here.

III Flight Test Results

In order to monitor the performance of the attitude control system during flight and to obtain useful data, important parameters are measured using the telemetry system; in addition, a star camera is also installed in the satellite for monitoring the attitude control system. Based on data collected during three flight tests, the performance of the attitude control system under three different phases of operation and preliminary analysis results are reported below.

1. Phase 1 - Elimination of Initial Attitude Bias

Telemetry data indicate that among the three satellites, the first satellite had relatively poor initial attitude bias; the two subsequent satellites showed significant improvement. The initial attitude bias of the first satellite is shown in Table 5, and the dynamic process of eliminating initial bias is shown in Fig 10.

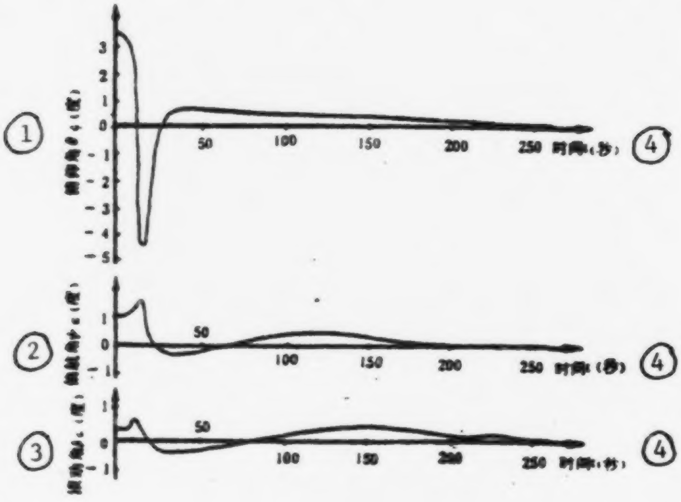
Table 5 Initial Attitude Bias of the First Satellite

key: 1. attitude bias
2. initial bias angle (degrees)
3. initial angular velocity (degrees/second)
4. channel
5. pitch
6. yaw
7. roll

④ 通道 \ 姿态偏差 ①	② 初始姿态偏差角（度）	③ 初始姿态角速度（度/秒）
⑤ 俯仰	+1.13°	−2.24
⑥ 偏航	+1.68	+0.17
⑦ 滚动	+0.98	−0.17

Figure 10 Dynamic Process of Initial Bias Elimination for the First Satellite (from gyroscope telemetry data)

key: 1. pitch angle (degrees)
2. yaw angle (degrees)
3. roll angle (degrees)
4. time (seconds)



The performance of the attitude control system during this phase can be seen from Table 6. In summary, the operation of the system during the initial bias elimination phase is quite normal; the results are in good agreement with theoretical analysis, and show that the system is well capable of capturing the initial attitude.

Table 6

key: 1. content
2. maximum overshoot or point of interest
3. time required to achieve ± 0.7°
4. satellite
5. degrees
6. seconds
7. monotonically decreasing

④ 内 ① 容 卫 星	② 最大超调角或过程特点	③ 进入±0.7°的时间
I	−5.36度 ⑤	12秒 ⑥
II	⑦ 单调衰减	12秒 ⑥
III	⑦ 单调衰减	6秒 ⑥

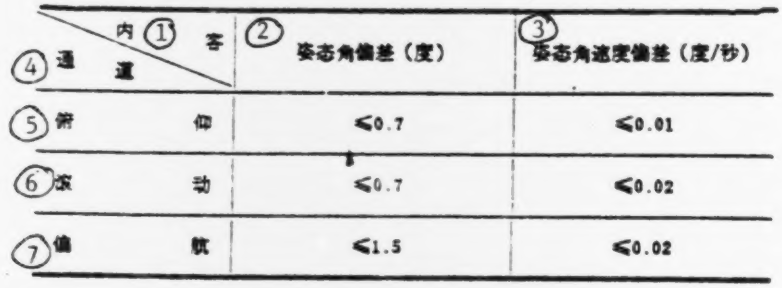
2. Phase 2 - Orbit

(1) Precision of Attitude Control

The actual precision of the attitude control system was obtained from data taken by the star camera. From a photograph of the stars, one first obtains the satellite attitude with respect to an earth-centered celestial coordinate system, then from orbit data it can be converted to attitude with respect to an earth-centered orbit coordinate system. The precision of the satellite attitude derived from star camera data is quite high. Typical attitude data are shown in Fig 11. The actually achieved biases in attitude angle and angular velocity are shown in Table 7.

Table 7 Actually Achieved Attitude Bias

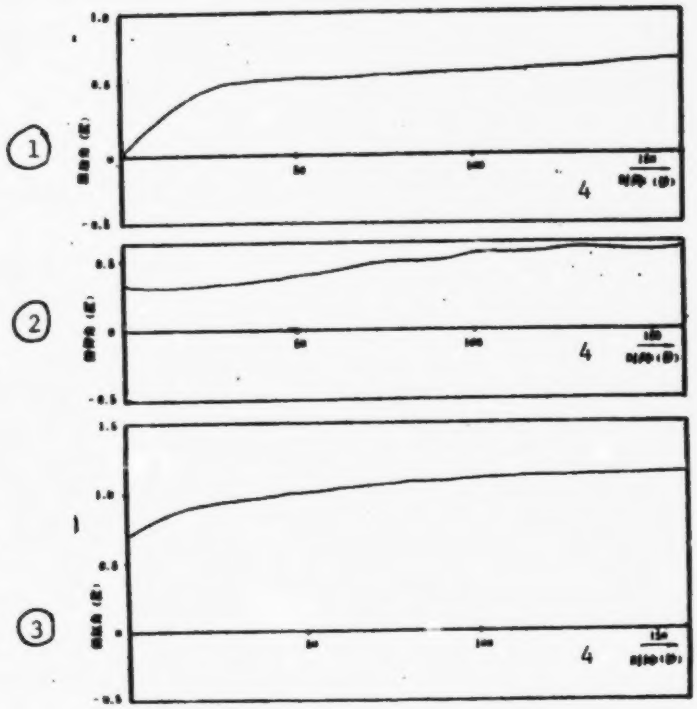
key:
1. content
2. bias in attitude angle (degrees)
3. bias in angular velocity (degrees/second)
4. channel
5. pitch
6. roll
7. yaw



内①容 ④通道	② 姿态角偏差（度）	③ 姿态角速度偏差（度/秒）
⑤俯仰	⩽0.7	⩽0.01
⑥滚动	⩽0.7	⩽0.02
⑦偏航	⩽1.5	⩽0.02

Figure 11 Typical Attitude Data Taken By Star Camera

key:
1. roll (degrees)
2. pitch (degrees)
3. yaw (degrees)
4. time (seconds)



(2) Noise Spectral Density in the Infrared Horizon Sensor

On the basis of telemetry data of the infrared horizon sensor and the gimbal angle of the gyroscope during the orbit phase, a preliminary analysis was made of the output noise from the horizon sensor. In the analysis it is assumed that the noise is generated by a steady-state random process. By using Fourier transforms one can compute the power spectral density of the output noise. After making dynamic corrections to the sensor system using the method of Ref 4, we determined the bandwidth of noise spectral density to approximately 12 times the orbit angular velocity. However, due to the limited amount of continuous data, this result should be regarded only as preliminary.

3. Phase 3 - Establishment of Re-entry Attitude

During this phase, the performance of the attitude control system in all three satellites was essentially the same. A typical performance curve is shown in Fig 12, which represents the entire dynamic process of the attitude control system of the third satellite. From Fig 12 the following observations can be made:

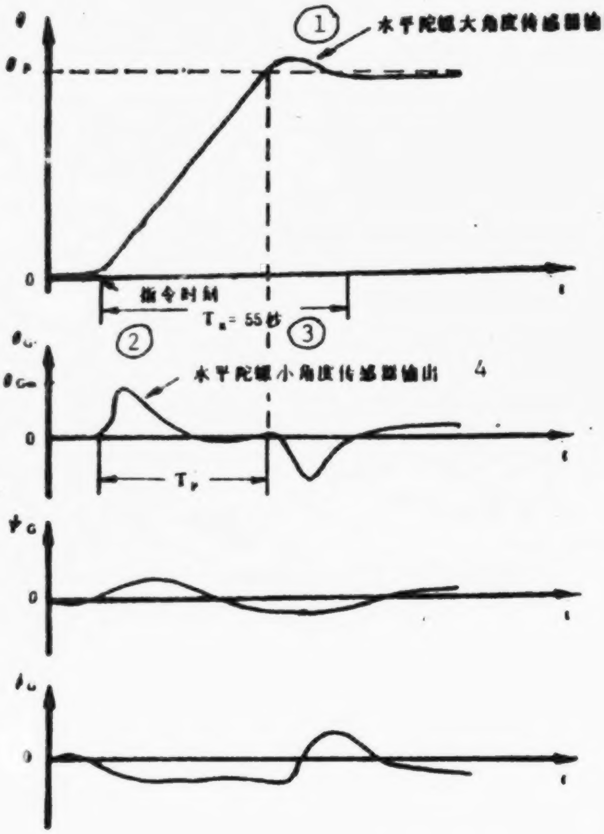
(1) the large angle sensor output of the horizontal gyroscope outer gimbal indicates that the satellite rotated an angle θ_r in the negative pitch direction; its dynamic process was in complete agreement with theoretical analysis.

(2) the small angle sensor output of the horizontal gyroscope outer gimbal indicates that at the beginning of attitude adjustment, the output rose rapidly in the positive direction, reaching the maximum overshoot angle; after a certain time T_p, the output becomes almost zero. One can deduce from this process that the programmed mechanism actually rotated an angle θ_p in the pre-determined direction at a pre-determined angular velocity $\dot{\theta}_p$, and the satellite also reached this angular velocity. Eventually, the satellite stabilized in the range $\theta_p \pm \varepsilon$. The entire attitude adjustment process took approximately 55 seconds.

The above results indicate that the process during the re-entry phase was basically as predicted, and the system operation was completely normal.

Figure 12 Typical Performance During the Re-entry Phase (obtained from gyroscope telemetry data)

key: 1. large angle sensor output of the horizontal gyroscope
2. command time
3. seconds
4. small angle sensor output of the horizontal gyroscope



4. Gas Consumption of the Attitude Control System

Results from the three flight tests indicate that the gas consumption of the attitude control system (either theoretical or actual consumption) successively decreased. In particular, the gas consumption of the third satellite was decreased by a factor of two compared to the first satellite. The main reasons for the reduction are as follows:

(1) Based on the first two flight tests, improvements were made in the system parameters of the third satellite, particularly in the key parameters of the sensor system. As a result, the noise suppression capability was increased, leading to lower gas consumption.

(2) A cut-off filter was installed in the optical system of the infrared horizon sensor, thereby reducing the effects of the sun, moon, and cloud on the output of the horizon sensor, and leading to lower gas consumption.

IV Conclusion

Results from the three flight tests have validated the design of the first-generation attitude control system of China's recoverable earth-orienting technology testing satellite. The operation of the system was shown to be reliable and normal. In particular, improvements in the third satellite were proven very effective, and its mission was successfully completed. Useful data and valuable experience were collected to provide a foundation for developing similar attitude control systems in the future.

For future efforts, we should improve the precision of the attitude control system, particularly in the yaw axis. In addition, we should apply system engineering and modern control theory to the design and development of attitude control systems to extend the operating life of the satellite and to reduce development cost.

3012
CSO: 8111/1472

BRIEFS

LARGE CAPACITY DESALINATION COMPLEX--Correspondent Chen Xiuchang reports: Recently, PRC's first electrodialysis seawater desalination apparatus with a daily output of 200 metric tons went into production in the Xisha Islands. At present, this is the largest equipment of this kind in the PRC. This seawater desalination apparatus has certain advanced characteristics and is economically sound. Its power consumption is relatively low. It is easy to operate and is equipped with automatic monitoring and alarm systems. The quality of the desalinated water not only meets with state regulations on water quality standards but is even better than the quality of drinking water in large cities such as Beijing, Tianjin and Shanghai. Its production cost is only 1/5 of the cost of shipping water in by boat. This seawater desalination apparatus was built by the State Maritime Bureau Oceanography Institute No 2 with assistance from the East China Chemical Engineering Institute, the Military Medical College No 2 of the Chinese People's Liberation Army, the Nanhai (South China Sea) Fleet and the Meishan Saltworks in Ningbo, Zhejiang. The apparatus passed on-site technical assessment in early July. [Text] [Beijing GUANGMING RIBAO in Chinese 24 Jul 81 p 1]

CSO: 4008/451

AUTHOR: YANG Dahua [2799 1129 5478]

ORG: Senior Engineer

TITLE: "Results and Understandings of the Reconstructed Vertical Kiln of Tangshan Municipal Cement Plant"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 7, 81 pp 17-20

ABSTRACT: The Tangshan Municipal Cement Plant was built in 1958. Before its reconstruction in 1974, it had 2 semi-mechanized vertical kilns. They produced, in 1973, 39,221 tons of clinkers and 70,573 tons of No 400 slag cement. When the material was unloaded from the kiln, there was a great deal of dust; therefore, the city invested 120,000 yuan to reconstruct a mechanized vertical kiln in the original plant to replace the original two. The plant designed and made the equipment and installed it under the guidance of specialists sent by the Cement Designing Academy. The reconstructed kiln has been operating very well, in spite of the earthquake. The annual turn-over rate is as high as 86.1 percent. The shop is now operated by 14 workers instead of the original 27. The paper introduces briefly the reconstruction design and the improvements over the original kilns. Drawings depicting the original kiln and the reconstructed one are included.

AUTHOR: None

ORG: Chatou Cement Plant, Guangzhou City

TITLE: "ϕ4 Nodule-forming Tray Equipped With an Automatic Scraper"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 7, 81 pp 28-29, 9

ABSTRACT: Just like nodule-forming trays of vertical kilns of other cement plants, the ϕ nodule-forming tray of the Chatou Cement Plant had the problem of being sticky. An automatic scraper was designed and installed on the tray. It includes a scraper blade and a handle, a gliding track and wheels, an electric motor, a decelerating device, and rollers. The automatic scraper can remove material accumulated on the bottom of the tray but it cannot remove the material adhering to the edges of the tray. In Chatou Cement Plant, measures were adopted to control the moisture of the nodule-forming tray when the automatic scraper was installed. These measures definitely improved the quality of the nodules, reduced labor intensity, and minimized the problem of sticky trays.

6168
CSO: 4009/432

AUTHOR: None

ORG: None

TITLE: "Important Speech Delivered by Vice Premier WAN Li [8001 6849] at the Award Meeting of Beijing, Tianjin, and Tangshan Engineering Competition"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 6, 30 Jun 81 p 1

ABSTRACT: An award meeting of Beijing, Tianjin, and Tangshan engineering competition, co-sponsored by the National Basic Construction Committee, the Chinese National Workers' Association, the National Bureau of Construction Engineering, the National Bureau of Labor, and the China People's Construction Bank, was held on 23 May in Beijing to present awards to 75 units for their various contributions to the 3 cities. At the award ceremony, Vice Premier Wan Li congratulated and thanked the recipients and pointed out the importance of constructing the capital into a beautiful city, Tianjin into an economic center of North China, and Tangshan from the earthquake damages. He also pointed out that in Handan City, the production value of each person averages 11,000 yuan and the average area of completed construction is close to 60 m^2/year. If all departments of construction of the country could reach that level, the goals of 4-modernizations would be reached much sooner. He encouraged all present at the meeting to summarize the experience of the past 30 years to continue in the spirit of diligent struggle for the service of the people and the users.

AUTHOR: GU Yicheng [7357 3015 2052]

ORG: None

TITLE: "Technique of Controlled Demolition of a Reinforced Concrete Building Framework in the City"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 6, 30 Jun 81 p 17

ABSTRACT: On 12 May, the technique of contolled demolition was successfully applied to remove a reinforced concrete framework in a busy section of Beijing. The framework included 24 reinforced concrete pillars of a height of 12.24m and 72 horizontal beams also of reinforced concrete. The structure was 42 m from the street and less than 10 m from the office of the work site. For the controlled demolition, 324 holes were drilled and a total of 21.75 kg of explosives were used. The space between the explosions was 75 milliseconds. The safety of the surrounding area was completely guaranteed. The paper includes a photo of the structure before it was demolished, but gives no clue as to the reason for the need of demolishing it.

AUTHOR: ZHANG Binggen [1728 3521 2704]
HUANG Lizhen [7806 0536 6297]

ORG: None

TITLE: "New Type of Side Pressure Meter"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 6, 30 Jun 81 p 31

ABSTRACT: The Changzhou Municipal Construction Designing Office of Jiangsu Province and the Liyang County Light Industry Machinery Plant successfully made the PY-1 and PY-2 side pressure meters. Since their applications in Oct 79, very good results have been obtained. The State's General Bureau of Construction and related organizations certified the 2 instruments to be of good property in Jul 80. These are special instruments used in the bore holes during engineering geological prospecting to determine such mechanical indices as the permissible load of the foundation, the modulus of deformation, etc. These indices are important parameters in designing the foundation of a building. The PY-1 side pressure meter is for manual compression. Compressed nitrogen pressure regulating valve is added to the manual compression operation for PY-2. Both of them are light and portable and produce accurate data with a quick test. A photo depicting one of these is included in the paper.

6168
CSO: 4009/429

AUTHOR: CHEN Yixiong [7115 0110 7160]

ORG: Liaoning Generating Plant

TITLE:: "Incremental Cost Scheduling and Economic Scheduling of Fossil-Fired Power Plant Loads"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 6, 5 Jun 81 pp 11-14, 10

ABSTRACT: Incremental-cost scheduling involves distributing electrical load among generators in accordance with their operating economy. The procedure for constructing incremental cost load scheduling curves is described. Economic load scheduling has somewhat broader applicability, since in addition to distribution of load among generating units it also involves the following considerations: (1) the possibility of dealing with fluctuations in load economically by shutting down or starting up individual generating units; (2) determining which units should be shut down and in what manner to produce the most economical effect; (3) decision between a complete shutdown of a unit or operation on zero load with a small quantity of steam in the phase regulating or electric motor mode; (4) determination whether to use fixed voltage or variable voltage load decrease. The mathematical formulas involved in these calculations are presented.

AUTHORS: DING Wei [0002 0251], GUO Weimin [6751 0251 3046]

ORG: Baotou No 1 Heat and Power Plant

TITLE: "Improvements to Power Station Boiler Unit Gas Burners for Use with Blast Furnace Flue Gas"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 6, 5 Jun 81 pp 18-20

ABSTRACT: Use of an on-site power station to burn blast furnace flue gas is beneficial in terms of both energy conservation and environmental protection. The Baotou No 1 Heat and Power Plant has five boilers, all 1950's Soviet models: Nos 1 to 3 are model TP-16 and Nos 4 and 5 are model PK-10, all with a capacity of 220 tons per hour. The TP-16 were already equipped with flue gas burners, but the design was ineffective, and accordingly the burner had not been used. The old burner was replaced by a new conical burner. The PK-10 was not equipped with a flue gas burner, and accordingly the improved burner design developed for the TP-16 was installed in these boilers as well. The results were increased operating stability, long service life and a saving on oil used for ignition and for combustion support at low loads.

AUTHOR: SONG Guobing [1345 0948 4426]

ORG: General Office of Electric Power Construction

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 6, 5 June 81 pp 32-38, 54

TITLE: "Discussion of Several Problems in Organization and Design of Fossil-Fired Power Plant Projects"

ABSTRACT: Techniques of organizing and planning the construction of fossil-fired power plants have advanced considerably throughout the world, and accordingly the General Office of Electric Power Construction is revising the 1964 "Construction Organization and Design Guidelines". Several problems involved in this revision are discussed. General procedures developed in the Soviet Union and Japan for coordinating the planning and design process are surveyed and a new tentative approach suggested. The effect of larger individual unit capacities on construction project organization is analyzed. Projects in different areas of China involving the same installed capacities have entailed different costs and levels of work, and factors which may lead to this divergence are discussed. Methods for drawing up comprehensive work schedules are considered, and a computer program developed by the Tongji University for the purpose, the "Model 719 Network Chart Calculation Program," is described. The importance of scientific organization of the construction process is noted, a formula for calculating peak manpower requirements is given, and ways of improving the design of construction site temporary structures are surveyed.

AUTHORS: CHEN Yili [7115 0110 3810], XU Deyu [6079 1795 5280], LI Jianguo [2621 1696 0948]

ORG: CHEN of Anhui Office of Electric Power, XU of Anhui Electric Power Experimental Research Institute, LI of Hefei Generating Plant

TITLE: "Experimental Investigation of Direct Ignition of Pulverized Coal with a High-Energy Arc"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 6, 5 Jun 81 pp 52-54

ABSTRACT: Tests have been conducted using a high-energy electric arc for direct ignition of pulverized coal. The arc design includes a plasma arc initiator. A flow chart of the test facility is given. The variables tested in the experiments were: different varieties of coal, density of coal-air mixture, minimum power required for ignition, and procedure for continuing coal feed after the arc is turned off. It was found that the arc method could be successfully used for coal ignition, saving ignition oil, and that successful ignition was possible in a range of coal densities below 3.46 kg of pulverized coal per kilogram of air. Tables and graphs of experimental results are given.

8480
CSO: 4009/331

AUTHOR: WANG Maolin [3769 5399 2651]

ORG: Health and Technology Department, Anyang District Bureau of Electrical Power

TITLE: "Analysis of Rural Electrical Accidants in Anyang District of Henan"

SOURCE: Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 6, 81 p 18

ABSTRACT: From 1969 to 1979, 1108 persons died from electrical accidents in the district. In these 11 years, 289 persons died in the year of 1971 alone. These accidents served as warning signals for the management departments of electrical power of all levels. The electrical voltages, the age, gender, and occupation of the victims, the season of occurrence of the accidents (57.9 percent occurred in the 4 months from Jun to Sep) are summarized. The causes of the accidents are stated in the paper to be 40 problems belonging to 5 categories: (1) Various connections not conforming to standards; (2) Lack of maintenance and repair; (3) Working or touching live wire; (4) Hand touching electrified things, including clothing hanging on power line to dry, leaking light bulb, and the body of an electrocuted victim, etc.; (5) Privately connecting a wire to steal power, to use electricity to catch fish, or to repair electrical equipment without permission. Safety measures, aiming at overcoming these problems and preventing such accidents,are listed.

AUTHOR: (1) ZHU Gelin [6175 5514 2651]
(2) YAO Guanghui [1202 0342 6540]
(3) ZHANG Haigen [1728 3189 2704]

ORG: None

TITLE: "Brief News in Electrical Engineering"

SOURCE: Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 6, 81 p 19

ABSTRACT: This paper includes 3 short items, contributed by each of the authors: (1) A metrix type combination program control device made by Shanghai Electrical Meter Plant No 3 has been certified as TCF-510 program control device in Dec 80. It may be used for automatic regulation and control of the coal distribution system, pulverizing system, water treatment system, etc. of a power plant. (2) Silicon controlled low frequency device made by Shanghai Switch Plant No 2, with the help of Shanghai Industrial University, Chongqing Steel and Iron Designing Academy et al, for Shengli Oil Pipeline Plant. The device has a specified power of 50 kw and an output frequency of 16.7 Hz. (3)Two types of heating element economizing on electricity have been made by Shanghai Electrical Heating Apparatus Plant. The existing far infrared heating elements commonly used by industries have the shortcomings of large heat inertia and insensitive temperature control. About 20 percent of power may be saved with the 2 new types. They have been certified in Dec 80 and will be produced in batches in the coming year.

6168
CSO: 4009/436

AUTHOR: GAO Peiyong [7559 3099 3057]
ZHANG Qinglin [1728 3237 2651]
LI Xiliang [2621 1585 0081]

ORG: All of Office No 4, Research Institute of Radiology, Chinese People's Liberation Army Military Academy of Medicine

TITLE: "Comparative Studies of Dose-effects on in vitro Culture Human Blood to Induce Chromosome Aberrations by Irradiation of 60kV, 180kV, and 10MV X-rays"

SOURCE: Beijing YICHUAN [HEREDITAS] in Chinese No 4, Jul 81 pp 1-4

ABSTRACT: X-ray is the radioactive ray best understood and most frequently applied by mankind and whenever the biological effects of a new type of radiation are studied x-ray is always used to compare. In studies on chromosome aberration induction of various types of radiation, a large quantity of experimental data of γ ray, neutrons, electrons, and other particles have alreay been compared with those of x-ray. Before such comparisons are relevant, chromosome aberration effects of x-ray of different doses should first be thoroughly understood, however. This is the objective of the experiment reported in the paper. The doses of 60kV, 180kV and 10MV, which are the most commonly applied doses in clinical diagnosis and treatment at present, are compared for their dose-effects on human blood chromosome aberration induction. Extracorporeal human blood, 36 specimens, are used for comparison and the rates of induced mutant cells are computed and compared.

AUTHOR: ZHAO Renjun [6392 0086 0193]
ZHANG Yifen [1728 4135 2780]
ZHENG Youxia [6774 1635 7209]

ORG: All of Shanghai Research Institute of Plant Physiology, Chinese Academy of Sciences

TITLE: "Studies on Mutagenesis of Auxotrophic Mutants of Streptomyces qingfengmyceticus by NTG"

SOURCE: Beijing YICHUAN [HEREDITAS] in Chinese No 4, Jul 81 pp 6-8

ABSTRACT: For the purpose of preparing experimental materials for genetic research on Streptomyces qingfengmycetius, the authors used NTG, a mutagenic chemical of obvious effects, to treat the microorganism and to select various auxotrophic mutants of various hereditary labels. The distribution and the mutation mechanism of these mutant types are analyzed. The experiment uses the M15 strain of Streptomyces qingfengmyceticus, a high productivity mutant obtained from a wild strain through a series of mutagenic treatments, and the Q-100, obtained from treating a wild strain with high temperature to cause it to become a mutant, having lost its ability to synthesize qingfengmycin. Characteristics of the auxotrophic mutants obtained by NTG induction are identified, analyzed, and discussed.

AUTHOR: WU Zhenchang [0702 2182 0235]

ORG: Hangzhou Pharmaceutical Plant No 2

TITLE: "Effect of Induction With 5-Fluoroureacil or Lithium Chloride on High Producing Mutant Streptomyces rimosus 1626 Derived From Fast Neutrons Radiation"

SOURCE: Beijing YICHUAN [HEREDITAS] in Chinese No 4, Jul 81 pp 9-10

ABSTRACT: In the course of a project involving compound treatment of Streptomyces rimosus with fast neutron and lithium chloride (WEISHENGWUXUE TONGBAO No 3, 1977 pp 27-29) the author obtained a strain of high producing fast neutron induced mutant S.rimosus 1626. For the purpose of further improving the antibiotic production of this strain of mutant, an experiment is carried out to compare the mutagenic induction action of 5-flurouroureacil and lithium chloride. Results demonstrate that with 10 μg/ml of 5-fluoroureacil, the positive mutation rate is 35.9 percent; with 1 percent lithium chloride, it is only 11.4 percent. Compared with the untreated 1626 strain, the positive mutation rate through natural isolation is 22.9 percent, with a frequency of 6.5 percent in the range of productivity of 105-110 percent. If the oxytetracycline productivity rate is targeted at above 110 percent, mutants of such a productivity may be obtained only through 5-fluoroureacil treatment, at a rate of 1.3 percent.

6248
CSO: 4009/438

AUTHOR: XIAO Youfu [5135 0645 5346]

ORG: Research Institute of Sonics, Chinese Academy of Sciences

TITLE: "Lipote (White Dolphin) Qiqi and Its Sound"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese Vol 3 No 7, 16 Jul 81 pp 2-3

ABSTRACT: Last year, the Wuhan Research Institute of Marine Biology, Chinese Academy of Sciences captured a live white dolphin and named it Qiqi. The white dolphin was mentioned in ERYA, a book of Han Dynasty (more than 2,000 years ago.) In Jin Dynasty [265-420 A.D.] GUO Pu [6751 3877] in his commentary on ERYA, gave the white dolphin a more detailed description. This paper briefly describes the historical record in China and the modern biological classification of this rare mammal. At present, these white dolphins reside only in the middle and lower reaches of Changjiang [Yangzi River.] Aside from describing such properties as being a fast swimmer, etc. the paper emphasizes the obvious degeneration of vision and the extremely well developed ears. A white dolphin sends out sonar signals through its nasal passage and uses the reflection wave to determine the distance, the size, and the nature of the target. The sonic signals of the white dolphin may be divided into 2 kinds: the long signal, lasting about half a second, at a frequency of about 6 kHz, are clearly audible to humans. The other is short, lasting 10-20 μsec only, and in a short chain of sonic pulses, which the author believes to be reply signals. These and other observations of the dolphin are discussed.

AUTHOR: YUAN Jizeng [0626 4949 1073]

ORG: Tianjin Research Institute of Fire Control Science, Ministry of Public Safety

TITLE: "Raging Fire of an Oil Tank"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese Vol 3 No 7, 16 Jul 81 pp 36-37

ABSTRACT: At 9:45 in the night of 12 Sep 79, 2 oil pump workers were on night watch in a certain plant. One of them went to the oil tank to check the oil supply condition. There was no light. He flicked his cigarette-lighter for a peek. Instantly, an explosion was heard. The top of the oil tank was blown sky-ward and followed by a raging fire. The tank had a capacity of $4,000m^3$ with half of the tank buried below the ground surface. It contained crude oil. The oil spilled out in the explosion and every stream of oil was like a snake of fire attacking everywhere . All the firemen could do was to cool off the nearby tanks to prevent them from catching fire. At 12:00 midnight, suddenly the burning tank produced a large quantity of vapor and oil bubbles, which boiled over and caused everything to be engulfed, including 2 other oil tanks, 4 fire engines, and the entire plant. The fire kept burning for 14 hours. More than 10 persons were killed and the loss of property was estimated at several million yuan. This fire demonstrated the urgent need of developing techniques for controlling this type of explosive fires. Several automatic fire extinguishing devices and techniques are briefly described.

6168
CSO: 4009/428

END

JPRS 78862

31 August 1981

China Report

SCIENCE AND TECHNOLOGY

No. 123

Civil Air Defense Project Design Standards

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78862

31 August 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 123

CIVIL AIR DEFENSE PROJECT DESIGN STANDARDS

Beijing RENMIN FANGKONG GONGCHENG SHEJI GUIFAN in Chinese 1980 pp i, 1-86

[Text of book "Civil Air Defense Project Design Standards," published by the National Civil Air Defense Guidance Group Office]

CONTENTS

Preface.. i

Chapter I. Construction.. 1

§1. Basic Requirements... 1

§2. Flat Surface, Sectional Designs of Tunnels................... 2

§3. Entrance and Exit Designs.................................... 6

§4. Openings Protection Designs.................................. 9

§5. Diesel Generator Station and Auxiliary Rooms................. 14

§6. Water Drainage, Flood Prevention, and Moisture Prevention....... 16

Chapter II. Structures... 19

§1. General Specifications....................................... 19

§2. Materials.. 20

§3. Defense Against Early Stage Nuclear Radiation................ 21

§4. Structural Designs.. 22

§5. Structural Requirements..................................... 27

§6. Gunite Supports... 36

Chapter III. Protection of Openings............................. 43

§1. General Specifications...................................... 43

§2. Protective Airtight Doors................................... 44

§3. Suspended Plate-Type Valve.................................. 48

Chapter IV. Ventilation

§1. General Specifications...................................... 50

§2. Secure Ventilation.. 51

§3. Natural Ventilation... 53

§4. Mechanical Ventilation...................................... 53

§5. Air Treatment... 56

§6. Ventilation of Diesel Power Generating Stations............. 59

§7. Ventilation for Other Types of Shelters..................... 61

Chapter V. Water Supply and Drainage............................ 62

§1. Water Supply.. 62

§2. Water Drainage.. 64

§3. Cleaning and Disinfection................................... 65

§4. Firefighting.. 65

§5. Cooling Water and Oil Supply for Diesel Generating Stations....... 66

Chapter VI. Electric Power and Lighting.......................... 68

§1. General Specifications...................................... 68

§2. Power Supply.. 68

§3. Electrical Circuits.. 69

PREFACE

The guiding principle of making overall planning, stressing priorities, coordinating peacetime with wartime conditions, and emphasizing quality must be followed in the construction of civil air defense projects. These projects must be solid, suitable, economical and rational. They should serve socialist construction and the people's livelihood during peacetime, as well as insuring that they can cope with the enemy's air raids and help to wage steadfast struggles in the cities.

These standards are applied to the three types of civil air defense projects--tunnels, tunnel fortifications, and dugouts--that can resist ground ultra pressure of 1 kg/cm^2 and 3 kg/cm^2 caused by shock waves from a nuclear explosion. The emphasis is on tunnels sheltering personnel, which are used by engineers and technicians engaged in building civil air defense projects. The contents of standards [or provisions] that are similar to those pertaining to tunnels, caves, and industrial and civil buildings are not listed here and, in this regard, the relevant state standards (or provisions) must be followed.

CHAPTER I--CONSTRUCTION

Section 1. Basic Requirements

1-1-1. Civil defense construction projects must be integrated with urban and capital construction projects. They must also have unified arrangements, overall planning and rational distribution so as to avoid interference with ground surface buildings, underground pipelines, and other underground structures.

1-1-2. Every effort should be made to build tunnels in the mountains and on high ground in the city to utilize fully the capacity of natural protective cover layers.

In the plains, deep tunnels must be dug. The depth should be based on utilization of the tunnels and the force of resistance. These projects are determined by comprehensively analyzing the aspects of economy, construction conditions, and easy access to exits and entrances.

In case of difficulties encountered in the deep excavation of tunnels where the underground water table is high and soil conditions poor, it is possible to build dugouts. However, the thickness of earth-covered roof must meet the requirements of preventing early stage radiation.

Note: "Tunnel fortifications" mean employing the "undercut" method of building tunnels in the mountains. "Tunnel" denotes the employment of "undercut" method of building tunnels on flat land. "Dugout" means the employment of the "open digging" method of building single construction projects.

1-1-3. A civil defense project must be a project of networks that is flexible and linked together to facilitate dispersion. It can be divided into a number of protective units in accordance with the administrative unit, tunnel utilization, and force of resistance. Each protective unit itself becomes a system.

1-1-4. A civil defense project must integrate peacetime with wartime conditions. It must benefit peacetime use as well as meet wartime requirements. Appropriate measures must be taken with respect to flat surface arrangements, ventilation and filtration, decontamination, power supply for illumination, water supply and drainage, airtight protection, communcations, moisture and humidity prevention, and indoor installations and repair in order to insure the protection of personnel and the necessary conditions for livelihood.

1-1-5. In a civil defense tunnel project, the axis of tunnel alignment, position of exit and entrance, and type of flat surface arrangements must be rationally selected in accordance with the protection and application requirements, the topography, geology, hydrological geology, underground pipe network, and local normal wind direction so that the air in the tunnel will flow freely and natural ventilation will be fully in effect.

1-1-6. The exposed position of civil defense tunnels, such as exit and entrance, air inlets and outlets and smoke exhaust openings must be camouflaged, and the methods of camouflage must be in accordance with the prevailing local conditions. The materials being used must be locally available to achieve the effects of environment harmony. Considerations must also be given to the feasibility of clearing debris from the area following a destructive blast.

1-1-7. Civil defense projects must be far away from the major targets that are susceptible to attack by the enemy, workshops and warehouses susceptible to fire and explosion, as well as tanks storing large quantities of toxic liquids and toxic heavy gases.

1-1-8. The interior fittings of civil defense tunnels should be simple, austere and suitable. Fittings must be obtainable locally. Use moisture-proof, rot-proof, and incombustible materials. All pre-storage items must be given anti-corrosion treatment.

Section 2. Flat Surface, Sectional Designs of Tunnels

(I) Flat Surface Arrangement

1-2-1. The flat surface arrangement of civil defense tunnels must be consistent with the following requirements:

a. The location of tunnel fortifications and tunnel projects must be so arranged that the protective layers are fairly thick and geological conditions favorable.

b. Zoning must be clear-cut and definite; contact convenient; and mutual interference minimum.

c. There must be a simple configuration, favorable to natural ventilation, easy to construct, install, and repair.

1-2-2. Axis arrangement must conform to the following requirements.

a. The alignment of the tunnel axis must avoid effects of pressure from building wall foundations.

b. The alignment of the tunnel axis should go through the section where the rocks are complete and stable and follow the width and thickness of the mountain shape. Avoid faults, melted caves, and geologically crushed bands. Also, make it perpendicular to the alignment of the rock layers.

c. The deflection angle of axis must not be less than 90°. When the axis is intersected, its minimum included angle should not be less than 60°. When transportation is required, the angle of deflection must be shaped like an arch. Its curve radius must be determined on the basis of utilization. Generally it should not be less than 10 meters.

1-2-3. Room arrangements must conform to the following requirements:

a. Noisy rooms must not be near quiet rooms.

b. Rooms that diffuse large amounts of moisture must be kept a distance from rooms requiring high humidity.

c. Rooms that are susceptible to fire and explosion must have independent arrangement. Protective airtight doors must be installed in joint passageways to separate the rooms from the main body.

d. Rooms that release poisonous gases must be located near the exhaust outlets. Polluted water pools must be located in the direction of the downhill drainage slope.

1-2-4. Room arrangements should take the following forms:

a. For personnel shelters in tunnels, tunnel fortifications, and operations rooms, parallel passageway type, winding corridor type, double-lane or multiple-lane type (Figure 1-1) must be used.

b. Corridor-type, middle passageway-type, single-span, double span, and multiple span continuous type (Figure 1-2) should be used for personnel shelter in dugouts.

c. The perpendicular passageway type should be used for rooms producing noise.

1-2-5. Adopt the following specifications for areas of utilization.

a. Personnel shelter tunnel 1 m^2 person;

b. Command, communications tunnel 2-3 m^2/person

c. Hospital, first-aid station (including wounded personnel and operation personnel) 4-5 m^2/person

Note: (1) The above-cited areas of utilization do not include the areas of the airtight doors of the innermost passageway in the tunnel, of air, water, and electric power equipment rooms and of living subsidiary facilities rooms in the tunnels.

(2) The number of hospital health personnel is based on 50-80 percent of sickbeds.

1-2-6. Regarding natural ventilation in the tunnels, use the exist and entrances as air intakes and exhaust outlets. On the basis of the organization of airflow, use the construction vertical shafts as vents in the tunnels. Add ventilation vertical shafts in the dugouts. Do not use vent holes with small diameter and in large number.

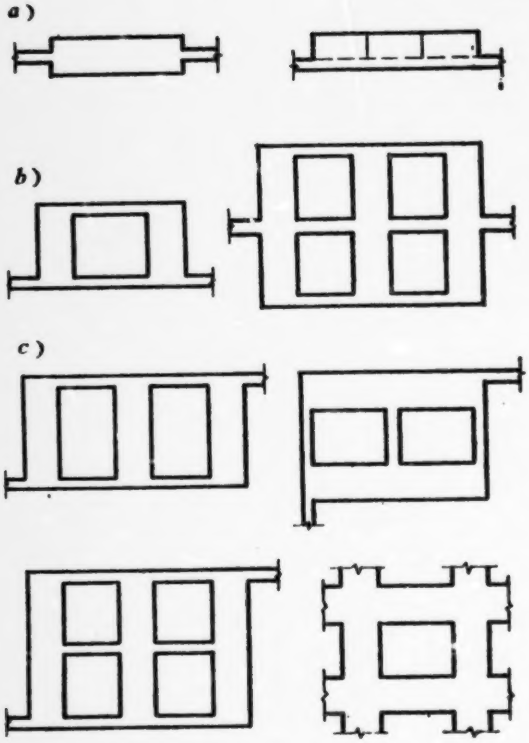


Figure 1-1. Flat surface layout of rooms in tunnels and tunnel fortifications
a) parallel passageway type; b) winding corridor-type; c) double-lane and multiple-lane type

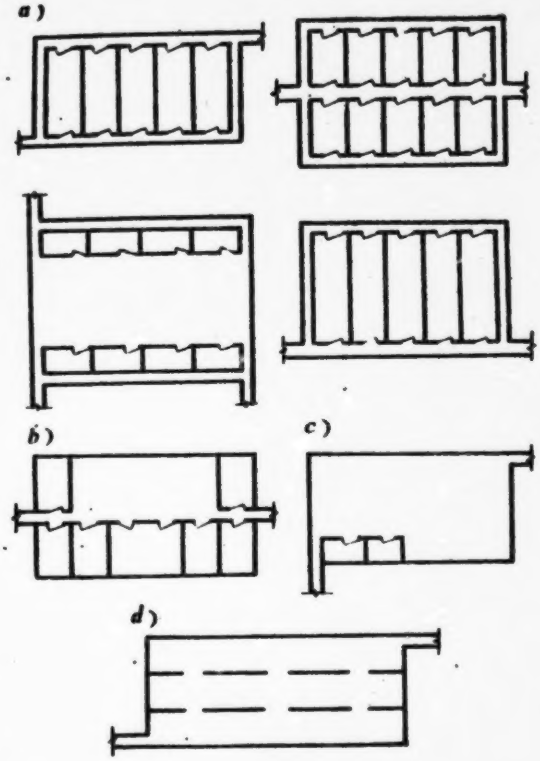


Figure 1-2. Flat surface room layout of dugouts
a) Winding corridor-type; b) middle passageway type; c) single span-type; and d) multiple span passageway-type

1-2-7. Installation of natural ventilation outlets must conform to the following requirements:

a. The number and location of ventilation outlets must be determined by the flat-surface layout of the tunnel, construction area, and organization of airflow. Each tunnel must have no less than one air inlet and one air exhaust outlet. When the outlet and inlet are used as natural ventilation openings, the angle of deflection between two passageway axes should not be less than 90°.

b. There must be a height differential between the natural ventilation openings. The high openings should be located in the positive pressure zone of the main winter wind direction.

c. The ventilation vertical shaft must be located at the end of the passageway or outside the sidewall and is connected with the short passageway. It must not be installed directly on the roof.

d. The vertical shaft can also serve as standby exit and entrance for the personnel. A climbing ladder is installed inside the shaft. The shaft openings must have facilities to prevent personnel from falling and rain water from gushing into the tunnel.

II. "Area" Design

1-2-8. In tunnel "area" design, such factors as type of tunnel, applications, requirements of inside equipment, geological conditions, building materials, and construction conditions must be taken into consideration so as to make the structural form simple, weight-bearing capability good, sectional dimensions appropriate, and application requirements satisfactory. Specifications should be uniform and categories reduced.

1-2-9. Dimensions of passageways are generally specified as follows:

a. Joint passageways: net width 1.5-2.0 meters, net height 2.25-2.5 meters; height of spring line not less than 1.5 meters.

b. Trunk passageway

Pedestrian main trunk passageway: net width, 1.5-2.0 meters; net height, 2.25-2.5 meters; height of spring line not less than 1.5 meters.

Note: (1) "Main trunk" denotes passageway linking the city proper with the suburbs. "Branch trunk passageway" denotes tunnels linking various sections into a network and the pedestrian passageways linking the main trunk passageway.

(2) Net height denotes the height from the tunnel's flat surface to the vault's under layer.

1-2-10. Covered Type

a. Straight wall arched-roof wall-type coverings (Figure 1-3) are generally used in tunnel projects. When the moisture-proof requirements are fairly high, it is necessary to have linings inside the wall coverings (Figure 1-4).

b. Straight wall arched-roof wall-type covering or gunite support is generally employed in tunnel projects (Figure 1-5).

As to tunnels with high moisture proof requirements, when the rock quality is good, it is necessary to employ separated wall-type coverings (Figure 1-6). When the rock quality is poor, linings may be added to gunite support or wall covering.

c. Straight wall, arched-roof, multiple-span, continuous structures and frames and shell structures may be used in dugouts.

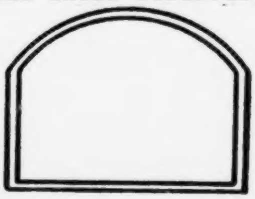


Figure 1-3 gunite support

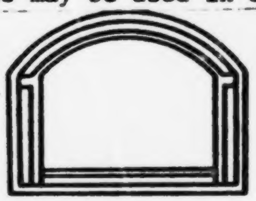


Figure 1-4 coverings

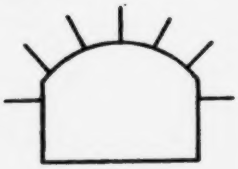


Figure 1-5. Abutting type covering

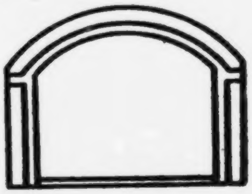


Figure 1-6. Separated wall-type covering

1-2-11. T joints may be employed in joining the tunnels. Avoid + shaped criss-crossing or intersecting.

1-2-12. The longitudinal gradient is determined by the followings:

a. The longitudinal gradient or tunnel passageway should not be less than 0.3 percent.

b. When the rooms' parallel passageways are being arranged, the longitudinal gradient of passageways should not be greater than 3 percent, generally 0.5-2.0 percent. Passageways outside the innermost airtight door should not have a gradient less than 1 percent and should slope outside the opening.

c. The ground surface gradient of a passageway or room requiring drainage of polluted water should not be less than 1 percent.

1-2-13. All pipelines not needed by the tunnel itself generally should not cut across the main body structure. Under special conditions, only water supply and heating pipelines are allowed to cross through. However, gate(s) must be installed inside the tunnel where the pipeline inlet is located. No dangerous pipelines, such as polluted water and gas pipelines, should be introduced into the tunnel.

1-2-14. Layout of pipelines must conform to the following requirements:

a. Generally building space should be utilized fully in laying air pipes. These pipes should be laid in the arched sections.

b. Electric cables, lines for illumination and communications must be laid in the open in the arched section and on the sidewalls in the ditches (trenches).

c. Water supply and heating pipelines are generally arranged on the lower side of the walls.

d. All types of pipelines must be centralized relatively on the basis of their performance requirements to prevent interference.

Section 3. Entrance and Exit Designs

1-3-1. According to the application requirements exits and entrances can be divided into main exits and entrances, general exits and entrances, and standby exits and entrances.

For peacetime needs, exits and entrances for lifting goods, machinery or equipment may be built. Exits and entrances for machinery or equipment not frequently used may be sealed tentatively.

1-3-2. Location of exits and entrances must conform to the following requirements:

a. It must be convenient to entering and leaving, and must be safe and concealed. It does not accumulate toxics easily, facilitates natural ventilation in the tunnels, and generally is not more than 200 meters away from where concealed personnel live and work.

b. The various openings must face different directions.

c. Outdoor exits and entrances should be located beyond the range where ground buildings collapse. The range of collapse is generally 0.5 times the eave height of buildings. For earthquake area with a magnitude of 8 and greater, add 0.7-1 times.

d. In areas where buildings are concentrated, when exits and entrances are unconditionally established outside the collapse range, effective measures should be taken to prevent blockage at the major or standby exits and entrances.

1-3-3. The number of exits and entrances must be determined on the basis of the use of and scale of the tunnels and natural ventilation needs. Each tunnel must have no fewer than two exits and entrances (including connected openings).

In sections where the trunk passageway goes through populated zone, two-way human traffic exit and entrance must be established every 150-300 meters.

1-3-4. Forms of exits and entrances

a. Through corridor-type or one-way ladder (or slope) exits and entrances must be used for ground passageways and dugouts (Figure 1-7, 1-8). The ladder gradient is generally around 35 degrees, not greater than 45 degrees. It is necessary to install handrails where there is two-way human traffic.

When it is necessary to use a ladder exit and entrance due to topographical limitations, a turning stairway with perpendicular exit and entrance may be employed. Perpendicular exits and entrances of turning stairways and "double-run" stairways of deeply excavated tunnels should not lead directly to the ground surface. A stairway exit and entrance should be employed near the ground surface. Short level passageways are linked in the middle (Figure 1-9).

b. The parts where the exit and entrance appear on the ground surface are generally level and have light-weight control cover plates. The outdoor exit and entrance should be properly located above the ground surface to prevent rain water from running in. When building a rain waterproof room, make sure it is in harmony with the environs; light-weight materials should be used in the construction.

c. The through-corridor- or one-way-type should be employed for tunnel personnel exits and entrances. When natural protective screens are available or incoming and outgoing motor vehicles and equipment are required, straight-through type exits and entrances may be used.

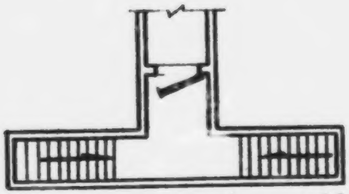


Fig. 1-7. Through corridor type exit and entrance

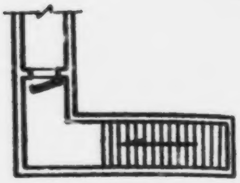
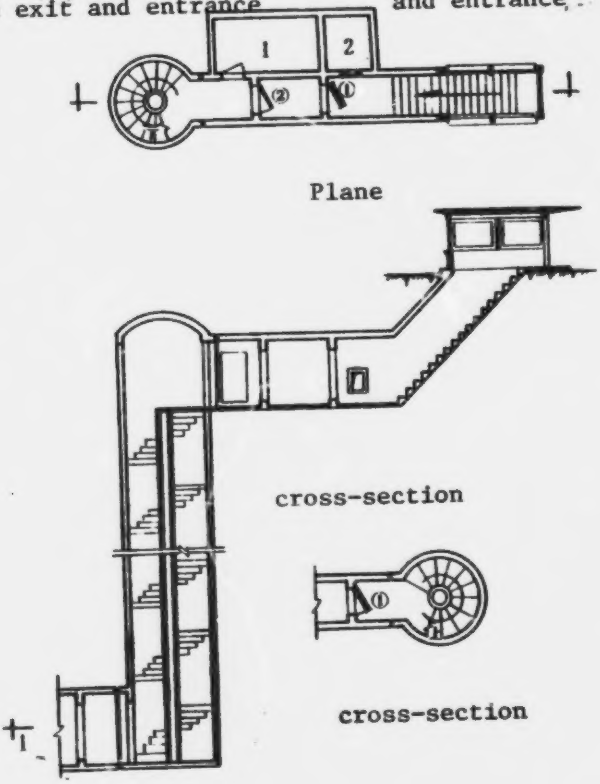


Fig. 1-8. One-way exit and entrance



Plane

cross-section

cross-section

Figure 1-9. Stairway perpendicular exit and entrance

1--blower room; 2--diffusion room; ① Airtight protective door
② Airtight door

1-3-5. The exit and entrance passageway dimensions must be adopted in accordance with the tunnel applications and Table 1-1.

Table 1-1. Exit/Entrance Passageway Dimensions Table (cm)

	Classification	Passageway			Doorway		Doorframe wall		
		Net width	net height of stairway section	net height of level section	Width	height	hinge edge width	lock edge width	door ridge height
personnel shelter tunnel	one-way human traffic	120-150	225	250	80	180	not less than 35	not less than 20 than 20	10 - 15
	two-way human traffic	150-200	225-250	275	110-130	180	not less than 40	"	"
hospital first-aid station	single track stretcher	150	225	250	80-100	180	not less than 35	"	"
	double track stretcher	200	250	275	130	180	not less than 40	"	"

Notes: (1) Net weight indicates the height from the passageway ground surface to the lower part of the arch. When a flat top structure is employed, the new height should not be less than .225 cm.

(2) When the net width of the passageway given in the table is less than the width of the doorway plus the width of the doorframe, the passageway should be partly widened in accordance with the latter.

Section 4. Openings Protection Designs

1-4-1. Airtight doors are to be installed at every exit and entrance for personnel. An airtight door may be added to the gate where a wash and decontamination room is located. An airtight door may be installed in the joint passageway of two tunnels (protection units).

1-4-2. The direction of gate openings must conform to the following requirements:

a. Airtight protection gates open outward.

b. Airtight gates generally open outward. When there are two or more airtight gates, the last airtight gate may be opened inward.

c. When the force of resistance grade of two tunnels (protection units) is different, the airtight protection gate in the joined passageway must be on the side of the tunnel with a low resistance force.

1-4-3. Anti-gas Passageways

a. An anti-gas passageway is the passageway between an airtight protection door and airtight door.

b. A tunnel gate generally has an anti-gas passageway. Two anti-gas passageways may be installed at the main door where a wash and decontamination room is located.

c. The length of an anti-gas passageway must serve to facilitate the ingress and egress of personnel [stretchers]. The anti-gas passageway with the main gate where a wash and decontamination room is located must meet the ventilation and anti-chemical requirements. Its volume must be reduced as much as possible. The ground and wall surfaces must be level and smooth and easy to wash. Floor drains must also be installed.

d. The following airtight measures for anti-gas passageways must be adopted:

1. The refilled layer outside the cover of the last anti-gas passageway of tunnels or tunnel fortifications must be airtight.

2. The slot clearance of ditch (trench) cover must be airtight, and the ditches in the last anti-gas passageway must be tightly filled.

3. Concrete should be poured onto the ground surface right on the spot. The thickness is generally 8-10 cm.

4. Concrete for the door frame wall of airtight gate and dividing wall must be poured on the spot. The thickness is generally 25-30 cm.

5. Pipelines passing through the airtight door frame wall must be airtight.

1-4-4. Wash and Decontamination Room and Simple Decontamination Room

a. When the outside of the tunnel is contaminated, the wash and decontamination room and simple decontamination room must be established at the main gate through which personnel are still coming and going.

b. Wash and decontamination room generally consists of undressing room, a shower room, and a clothing inspection room. It is located on one side of the anti-gas tunnel. An underground hospital can be established in the anti-gas passageway.

c. When there is one anti-gas passageway, the wash and decontamination room located on one side of the anti-gas passageway should be entered from the anti-gas passageway and exited from the clean zone. When there are two anti-gas passageways, patients would enter from the No 1 anti-gas passageway and exit from the No 2 anti-gas passageway (Figure 1-10). The exit and entrance of the shower room should have airtight doors. See Figure 1-11 for the plan of the exit/entrance where the wash and decontamination room is located.

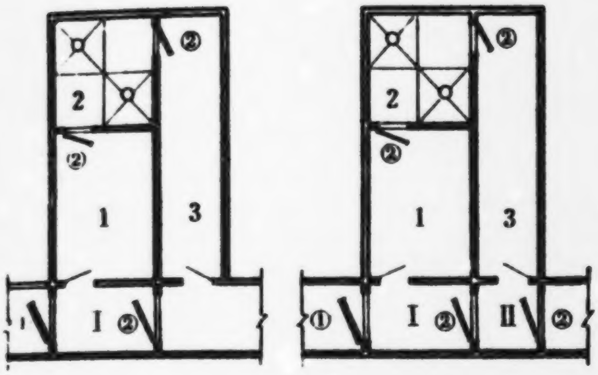


Figure 1-10. Plan for the Wash and Decontamination Room

1. Undressing room
2. Shower room
3. Clothing inspection room

I, II Anti-Gas passageways
    (1) Airtight protective door
    (2) Airtight door

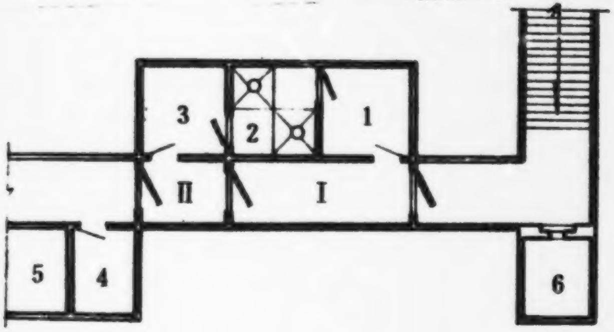


Figure 1-11. Flat surface layout of exit/entrance where a wash and decontamination room is located

1. Undressing room
2. Shower room
3. Clothing inspection room
4. Suction blower room
5. Lavatory
6. Diffusion room

d. The area of the wash and decontamination room is determined by the following requirements:

(1) The number of persons in each group entering the room is 2 times the number of shower heads.

(2) Undressing room, inspection and dressing room, 1.5 m^2 per person; shower room, 1 m^2 per person.

(3) Wash and decontamination area of hospital and first-aid station is determined by convenience of the wounded and sick in entering and leaving.

e. For the decontamination room, prepare a supply of skin disinfectants, cleansing agents, wash basins (buckets), etc. The items are generally placed on one side of the anti-gas passageway. The area measuring 6-10 cm^2 can also be located in the middle of the anti-gas passageway.

f. The ground and wall surfaces of the wash and decontamination room and simple decontamination room must be flat and smooth and easy to clean. Floor drains must also be installed.

Note: (1) "Wash and decontamination room" denotes a room where personnel are being totally decontaminated.

(2) "Simple decontamination room" denotes a room where personnel are being partially decontaminated.

1-4-5. Construction Designs of Valve, Valve Chamber, and Diffusion Chamber Must Conform to the Following Requirements:

a. Valve

(1) When the side of valve is installed in the direction of the shock waves, the depth "imbedded into" the wall must conform to the requirements (Figure 1-12) of formula (1-1).

Figure 1-12. Valve installation

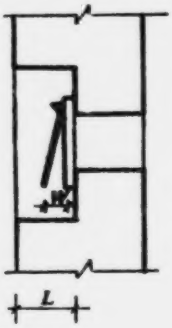
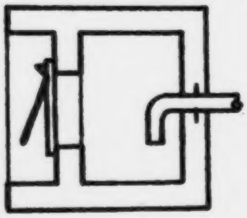


Figure 1-13

Valve room installation



$$L \geq 2W \tag{1-1}$$

Where L--depth (cm) of Valve "imbedded in"

W--width (cm) of valve's "suspended opening"

(2) When the valve is installed in the direction of the shock wave, the depth of valve imbedded into the wall should be based on the criterion that the suspended plate is not exposed on the wall surface.

b. Valve chamber

(1) The area of the valve chamber must conform to the requirements of formula (1-2):

$$V_h = (15\text{-}20)\ f_r \tag{1-2}$$

Where V_h--valve chamber's area (m^2)

f_r--area of valve's air inlet (m^2).

(2) Length of the valve chamber (valve's rear net depth) must not be less than 1 meter. The width and height must take into consideration of the construction and repair requirements.

(3) Use of valve--when the valve eliminates the wave system, the pipe of the valve chamber's air outlet should be bent downward at 90°. (Figure 1-13)

c. Diffusion chamber

(1) The length and width of the diffusion chamber must conform to the requirements of formula 1-3.

$$L\text{--}(2\text{-}3)B \tag{1-3}$$

Where L--length of diffusion chamber (m)

B--diffusion chamber's width (m)

(2) The width and height of the diffusion chamber should not have a difference of several times. They should be as square in shape as possible. The sectional area should conform to the requirements of formula 1-4:

$$F_k \geq 9f \tag{1-4}$$

Where F_k--section area of diffusion chamber (m^2)

(3) The air inlet of the diffusion chamber must enter from the front, while the air outlet must be located on the sidewall 2/3 the length of the diffusion chamber from the air linlet (Figure 1-14).

1-4-6. Gate-type valves should be adopted for valves and diffusion chambers. When a suspended plate-type valve is used, manhole (50x80cm) and airtight protective covers must be installed. Floor drains should be installed in the valve and diffusion chamber, and when there is drainage, water collection wells should be sunk in a suitable location.

1-4-7. Filtration, Air Blower Rooms

a. Filtration and air inlet blower rooms must be arranged on the same side of the air inlet attenuation facilities and should be near the inlet and outlet.

b. The flat-surface layout of filtration and air inlet blower rooms must be determined by the model of the filtering equipment. It is generally arranged separately.

When the filtration and air inlet blower rooms are arranged separately, the filtration room must be located on the side of the anti-gas passageway. The gate is opened inside the anti-gas passageway, and airtight doors must be installed. The air inlet blower room must be located close to the filtration room in the clean zone (Figure 1-15). When the filtration and inlet blower rooms are combined into one room, they may be established in the clean zone and installed with airtight doors.

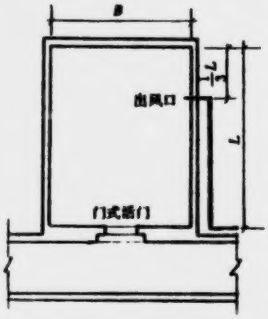


Figure 1-14. Air inlet and outlet arrangement

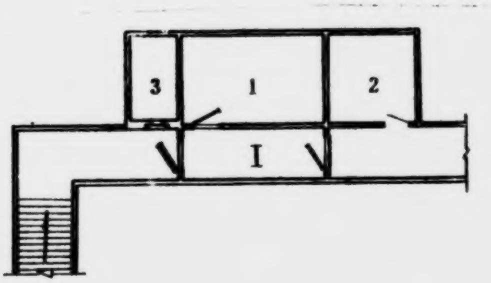


Figure 1-15. Flat-surface layout of filtration room equipped with exit and entrance

1. Filtration room 3. Diffusion room
2. Air inlet blower room

c. The ground surface and wall sides of the filtration room must be level and smooth and easy to clean and must have floor drains.

Sound-proofing measures must be taken in the air blower rooms, such as establishing soundproof rooms and doors.

1-4-8. Sealed water wells

a. A sealed water well must be sunk at the end of the drainage pipe ditch to be built. It should be located in back of the airtight protective door and in front of the first airtight door. A sealed water well must also be sunk when the airtight doors of the airtight tunnel section pass through the construction drainage pipe ditch.

b. The depth of the pipe bend submerged in the water in the sealed water well should not be less than 30 cm. A movable cover is installed above the well.

Section 5. Diesel Generator Station and Auxiliary Rooms

(I) Diesel Generator Station

1-5-1. According to its relations to the main body of the tunnel, a diesel generator station (hereafter known as power station for short) is generally divided into three types: joint passageway power station, entrance section power station, and independent power station (Figure 1-16).

The entrance section power station may be adopted when the generating sets are few in number and capacity is small.

1-5-2. The location of the power station must be consistent with the following requirements.

a. It must be as close as possible to the center of power load.

b. It must be convenient to transportation, incoming and outgoing lines and oil supply.

c. The operational zone must be at a distance and yet quiet.

d. The entrance section power station of the tunnel project must be located in the quiet, covered section.

1-5-3. The power station's engine room and control room must be located separately. The engine room is a contaminated room, while the control room is generally not permitted to be contaminated. An airtight dividing wall and an airtight observation window should be installed between the engine and control rooms. Anti-gas passageway or other airtight anti-gas facilities must be installed. The gate linking the control room and the main body of the tunnel must be located in the clean zone.

The generator control panel is fixed on the generating set at a small-capacity power station. The engine and control rooms can also be combined and located in the contamination zone.

The entrance/exit of the engine room can be located in the anti-gas passageway and airtight doors can be installed.

1-5-4. The dimensions of the engine and control rooms must be determined by the installation and inspection/repair requirements. A polluted water pool is generally established in the engine room. A lavatory may be established alone on the basis of needs. A soundproof telephone booth should be established ina power station that combines the engine and control rooms.

The power station's water storage pool and oil storage room must be arranged separately. Such water cooling equipment as vertical cooler must be near the water storage pool. A fireproof wall and fire-prevention door must be installed between the oil storage and engine rooms.

1-5-5. Vibration- and sound-proof measures, such as establishing a small soundproof room, a soundproof cover and shock absorption foundation, must be adopted. The ground and wall surfaces must be level and smooth and easy to clean. Floor drains must also be installed.

II

1-5-6. Tunnel project assured of water supply and drainage must have flush toilets.

1-5-7. Restrooms (toilets) must be installed in locations where personnel are concentrated and where they are convenient to use. They should be individually established near the air exhaust and should be protected. Each airtight section of the main passageway should have toilets.

1-5-8. Sanitation equipment is determined by the following requirements:

a. Men's toilets--one for 40-50 persons.

b. Women's toilets--one for 30-40 persons.

c. The number of urinals for men's restrooms must be the same as the number of toilets. When installing a urinal trough, every 50 cm is considered one urinal.

1-5-9. The area of flush toilet lavatory should drain toward the slope. The ground elevation should be 2 cm lower than the ground surface and the joint passageway and rooms.

III. Underground Kitchens

1-5-10. A single civil defense tunnel project generally does not have an underground kitchen. It is possible to have uniform arrangements for a network of tunnels, installing a suitable number of underground kitchens and in coordination with ground-level eateries, building underground restaurants that serve in wartime as well as peacetime. In wartime, they can be used as food processing shops.

1-5-11. When arranging an underground kitchen, the following requirements must be complied with:

a. An underground kitchen is generally established at the "mouth" of the tunnel project. It can also be established independently, linking the passageway and the main body.

b. An independent inlet an exhaust air (smoke) system must be installed.

c. All openings facing outside the tunnel must have airtight protective devices to meet the protection requirements of the tunnel's main body.

Section 6. Water Drainage, Flood Prevention, and Moisture Prevention

1-6-1. In making flood prevention and drainage designs for civil defense tunnel projects, it is necessary to proceed from the actual conditions and formulate a unified plan according to the type of tunnel, and utilize to the fullest the urban drainage system. Adopt simple, easy, and reliable methods, combining flood prevention with drainage and making use of gravitational flow to drain water.

1-6-2. Tunnel drainage designs must conform to the following requirements:

a. Utilize as much as possible the height differentials to drain the water from crevices and seepage water into the nearby river gullies and ditches or other seepage structures.

b. When the drainage outlets of ditches leading to the rivers are lower than the highest flood water level, it is necessary to adopt measures to prevent backward flows.

c. Do not cause the nearby ground buildings to sink or cave in unevenly.

d. Underground ditches (pipes) are laid every 30 to 50 meters apart and a check wall must be sunk at an intersection or turn.

e. Adopt tunnel with abutting wall cover and dig a drainage ditch outside the side wall.

f. Adopt tunnels with separated-wall covers and dig a drainage ditch outside the side wall.

g. Generally, a seepage well is not used for drainage so as to avoid polluting the underground water--i.e., the underground water resources.

h. Avoid accumulating water on the ground [above] the tunnel roof.

1-6-3. The arrangements of waterproof and moisture-proof layers must conform to the following requirements:

a. When the tunnel base plate's elevation is above the all-year-round underground water level and when there is no stagnant water, installation of a waterproof layer is not necessary. When it (the base plate's elevation--TN) is below the underground water level, a waterproof layer must be laid on the part under water.

b. When building a tunnel on a foundation that is permeably weak (clay and subclay) and there is stagnant water, take flood-prevention measures in accordance with the conditions of the tunnel underground installation and the conditions of having "forced" water.

c. Tunnel projects requiring moisture-proof measures must have moisture-proof layers.

1-6-4. Measures must be taken to keep water off the exits and entrances and air vents of tunnel projects that are near river banks and located on level and low grounds.

1-6-5. The design for flood prevention in the tunnel must meet the following requirements:

a. In accordance with the flood-prevention requirements and the situation of anti-flood materials, adopt measures to either make the structure itself flood resistant or add more flood prevention layers.

b. When the water pressure underneath the tunnel's base plate is considerable, it is necessary to use elevated arch type for the base plate.

c. When the tunnel project is being built with waterproof concrete, the structural thickness must not be less than 20 cm; the concrete's resistance to pressure must not be lower than 200 kg/cm^2. The seepage resistance grade must not be lower than 6 kilograms/cm^2.

d. The additional flood-prevention layer generally consists of ferric chloride, waterproof mortar and five coatings [of these materials]. When there is a serious underground soaking problem, it is necessary to employ flood prevention layers with externally abutted and rolled anti-flood materials.

1-6-6. When building a tunnel on rocks where underground water and crevice water develop, it is necessary to rely primarily on gravitational drainage. When restricted by topography and there is no way to have gravitational drainage, it is better to use deeply excavated tunnels.

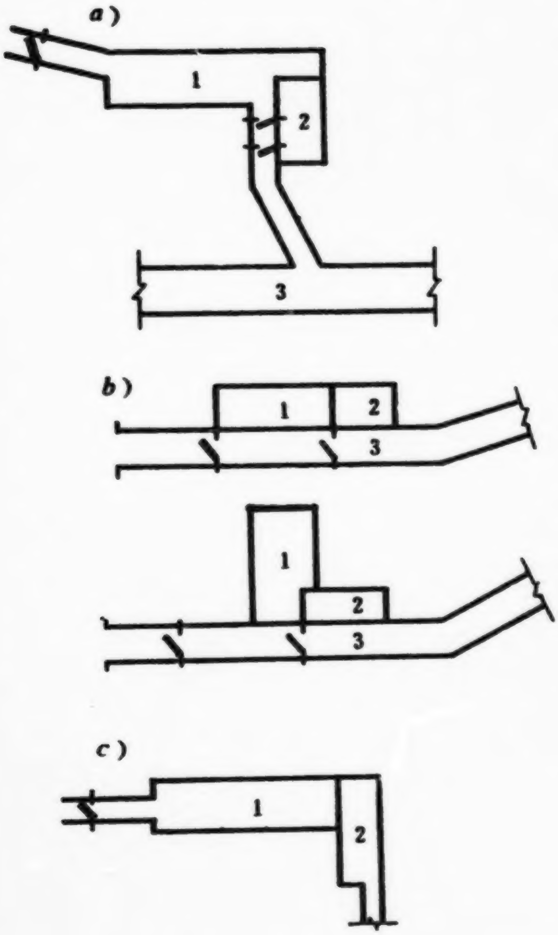


Figure 1-16. Types of power Stations

a) Continuous passageway-type power station;
b) Entrance power station; and
c) Independent power station

1. Engine room;
2. Control room; and
3. Tunnel clean zone

CHAPTER II--STRUCTURES

Section 1. General Specifications

2-1-1. The structures of civil defense projects normally bear the actions of dynamic and static loads. Dynamic load means the shock wave load from a nulcear explosion, while static load means the weights of rock, soil, and water pressure and structure.

2-1-2. In the structural design of a civil defense project, the cross-section thickness of structure, thickness of the protective layer and structural measures are generally determined by the defense of shock waves from a nuclear explosion and the initial stage of nuclear radiation.

The forces of resistance of various positions of the civil defense project and various positions of the structure must be suited to one another.

2-1-3. Measures for preventing fire and blocking (traffic jam) and making the project airtight must be taken into consideration in the structural design of the openings of a civil defense project to be constructed in areas where urban buildings are crowded and near the storage of inflammable materials. The structure's cross-section thickness must be appropriately thicker than that of explosion (blast) resistant structures.

2-1-4. Make sure that the structural design of a civil defense project is solid, suitable, and economical, and rationally select the structural form in accordance with such factors as project model, use requirements, grade of resisting forces, engineering geology, hydrological geology, building materials, and construction conditions.

2-1-5. Semi-covering, full covering, granite support or separated wall covering may be employed on tunnels and tunnel fortifications.

Whole unit-type, assembled whole unit-type, or assembled-type structures may be used on dugouts. When the assembled type is used, measures should be adopted to insure the structural whole.

Note: The rock-earth layer above the undercut tunnel project is called protective layer; the rock-earth layer above the open-cut tunnel project is known as earth-covered layer; when undercut or opencut is not yet indicated, the rock-earth layer above the tunnel project is generally known as protective layer.

Section 2. Materials

2-2-1. Structural materials of civil defense projects must meet the following requirements:

a. These materials must be obtained locally according to the prevailing local conditions. The materials obtained must conform to the specifications and use requirements.

b. Use concrete and reinforced concrete as much as possible.

c. When there are corrosive media present, anti-corrosion measures must be taken.

2-2-2. The designed strength, elastic modulus, and poission ratio of steel bars, concrete, and masonry products under the actions of static load must be selected according to the State standards.

Table 2-1. Strength-increasing coefficient of materials

Materials	Strength-increasing coefficient
I grade of steel rods	1.30
II grade of steel rods	1.15
III grade of steel rods	1.10
IV grade of steel rods	1.00
No 5 steel rods	1.20
concrete	1.40
gravels, concrete blocks, ordinary clay brick blocks	1.20

Note: (1) In the table, the strength-increasing coefficients of the same materials may be applied to the different strained conditions of drawing, pressing, bending and shearing.

(2) In the table, the strength-increasing coefficients of concrete has taken into consideration the later stage strength-increasing value of concrete with a time period of 6 months. As to parts requiring steam for curing of concrete mixed with pre-hardener, do not take into consideration the later stage increase in strength. Data given in the table must be multiplied by the reducing coefficient 0.85.

(3) Stones used as raw materials include fine gravels, coarse gravels, rubbles (lump stones).

2-2-3. During the simultaneous actions of the dynamic and static actions or the single action of dynamic load, the designed strength of the materials' dynamic force may be derived by multiplying the designed strength under the action of the static load with the increasing coefficient of the material strength as listed in Table 2-1.

2-2-4. Under the simultaneous actions of the dynamic and static loads of reinforced steel bars, concrete, and masonry products or the single action of dynamic load, the numerical value under the single action of the static load may be adopted for the elastic modulus and poisson ratio.

Section 3. Defense Against Early Stage Nuclear Radiation

2-3-1. The allowable total dose of early stage radiation entering into the the tunnel through the tunnel protective layer and exit-entrance passageway must not be greater than 50 coulombs. Tunnel designs must meet the requirements specified in 2-3-2- and 2-3-3-.

2-3- The minimum soil thickness required in the early stage of nuclear radiation must be determined on the basis of Table 2-2. When the tunnel protective layer is consisted of several different materials, separately multiply the thicknesses of various layers by the coefficients listed in Table 2-3 to obtain the soil thicknesses.

Table 2-2 Minimum soil thickness (cm) of protective layer for the defense of early stage nuclear radiation

Anti-shock wave ultra pressure (kg/cm^2)	1	3
Soil thickness	100	130

Table 2-3 Coefficients for converting into soil thicknesses of several kinds of materials

Names of materials	Brick-laid products dry-laid mixed rubbles	Rocks	Reinforced concrete, concrete, mixed rubble concrete, stone-laid products, concrete block-laid products
Coefficients	1.0	1.5	1.4

2-3-3. The size of doses of early stage nuclear radiation entering the tunnel from the exit/entrance is related to such factors as the total thickness of the topography near the exit/entrance, ground objects, forms and dimensions of exit/entrance, length of passageway, number of turns, protective doors (protective airtight doors). As to the civil defense tunnel projects, the resisting force of which is 1/3 kg/cm^2, the length of passageway should meet the requirements listed in Table 2-4.

Table 2-4. L_1 length (m) of passageway required for exits and entrances in defense against early stage nuclear radiation

No. of turns	Thickness of tunnel's earth roof covering (m)	Length of passageway (m) resistance 1 kg/cm^2	Length of passageway (m) resistance 3 kg/cm^2
0	1.0	4.7	
	≥2.0	3.5	
1	1.3		8.7
	≥2.0		6.5
2	1.3		4.5
	≥2.0		3.5

Note: (1) Passageway length denotes the length of the broken line inside the surface from the ground surface to the airtight door.

(2) The net cross-section volume of the passageway is 3.0 m^2. If the cross-section volume of passageway is greater than 3.0 m^2, correction should be made according to the following formula:

$$L'_t = L_t\sqrt{\frac{A_t'}{3.0}} \qquad (2\text{-}1)$$

Where L_t'--the minimum length (m) of passageway needed after correction is made.

L_t--net cross-section is the minimum length (m) of passageway computed on the basis of 3 m^2 (Table 2-4).

A_t'--Net volume (m^2) of cross-section of the passageway designed and actually adopted.

Section 4. Structural Designs

2-4-1. The designed dynamic load of civil defense structures must be determined by the attention of the rocks and earth caused by the compressed waves from the ground actions of nuclear explosion shock waves and the interactions of the waves and structures. Generally it can be transformed into an equivalent static load.

2-4-2. When making the structural design, it is necessary to superimpose the equivalent static load and static load (including rock and earth pressure; water pressure, and structural weight itself).

2-4-3. As to the structure of tunnel project open-cut in ordinary soil in natural humidity, when the refilled earth on the roof covering is less than or equivalent to one meter, the designed equivalent static load may be adopted in accordance with the following specifications:

a. When the uniformly distributed load is perpendicular to the structural roof covering, take 1.4-1.8 times the ultra pressure value of the sock waves from a nuclear explosion for reinforced concrete structures and take 1.9-2.3 times the ultra pressure value of nuclear explosion shock waves for structures of brittle materials (with masonry product-laid structure).

b. Take 0.5-0.75 times the equivalent static load value of the roof covering for the evenly distributed load perpendicular to the unit's base plate.

c. When the load of the tunnel's external wall level is evenly distributed, take 0.3-0.4 times the ultra pressure value of the shock waves from a nuclear explosion for crushed rock earth, take 0.4-0.5 times the ultra pressure value of the shock waves from a nuclear explosion for sandy soil, and take 0.3-0.9 times the ultra pressure value of shock waves from a nuclear explosion for clay soil (Take the lower limits for hard, hard plasticity and the upper limits for soft plasticity).

d. For strip footing, make the design according to the roof's action transmitted through the wall and pillars.

Note: The values given in this article are only suitable for use in structure designed according to the elastic working conditions. When the reinforced concrete structure is designed on the basis of elastic working conditions, as far as civil air defense tunnels are concerned in general, take the value specified above and multiply it by 0.75-0.85 and use the product as the designed equivalent static load.

2-4-4. As to a tunnel structure built by the open-cut method in ordinary soil in natural humidity, when the thickness of the roof's refilled earth is $H \geq 10$ (m), and the evenly distributed equivalent static load is perpendicular to the compressed wave acted on the roof, take 1.0 times the shock wave's ultra pressure value. At this time, the structure should be designed in accordance with the elastic work conditions.

Note: L is the outer "wrap" dimensions (short side, meter) of the tunnel structure.

2-4-5. The following specifications may be adopted with respects to designing the equivalent static load of tunnel projects dug out from earth below the underground water level.

a. Take 2.3-2.6 times the ultra pressure value of shock waves from a nuclear explosion for the perpendicularly and uniformly distributed load of the structural roof cover and base plate.

b. For the level and evenly distributed load of external side wall, take 1.1-1/4 times the ultra pressure value of shock waves from a nuclear explosion.

2-4-6. As to the structures of tunnels and tunnel fortifications built by the undercut method on rocks and in earth, in addition to taking into consideration the maximum pressure of compressed waves, it is necessary to consider the arch effects of natural protective layer of rock-earth on the tunnel. With respect to tunnels and tunnel fortifications capable of resisting 3 kg/cm^2 and under of ultra shock wave pressure, when the thickness of natural protective layer of rocks (types III, IV) is greater or equal to 1.0 times the "pore" span, the thickness of soil (clay and subclay of hard or hard plasticity) natural protective layer is greater or equal to 4 times the "pore" span, it is possible to make a design according to static covering.

When the above-cited conditions are not met, the design should be made according to a dynamic covering.

2-4-7. With respect to the dynamic analyses of the structures of civil defense projects, program of special design may be employed to make elastic or elastoplastic analyses. Generally it is also possible to make analyses according to the given equivalent load and by the static method.

2-4-8. When designing the structures of civil defense projects in accordance with the elastic-plastic work conditions, the allowable limiting conditions must be determined in accordance with different types of tunnels and different application requirements.

The structural operating conditions can be expressed by the allowable ductility ratio $[\beta]$:

$$[\beta] = - \frac{[y_m]}{y_r} \qquad (2-2)$$

where $[y_m]$--the allowable maximum deflection (cm) of structural parts;

y_r--deflection of plastic limit of structural parts (cm).

According to the use requirements, reinforced concrete structures are generally divided into the following three situations:

a. It is possible to design structures with fairly high use requirements and strict airtight and water-proof requirements according to the elastic operating stage.

b. It is better to design structures of ordinary civil defense tunnels having airtight and water-proof requirements in accordance with the elasto-plastic stage.

c. Design structures that do not give considerations to personnel cover during wartime and have no airtight and water-proof requirements according to the elasto-plastic operating stage.

When reinforced concrete structures and designed on the basis of the elastoplastic operating stage, the allowable ductility ratio $[\beta]$ value may be adopted in accordance with the use requirements and strained condition according to Table 2-5.

Table 2-5. Allowable ductility rate $[\beta]$ value

Strained condition / Use Requirements	Bent	Major eccentric compression	Minor eccentric compression	Axial compression
Second situation	3.0	2.0		
Third situation	5.0	2.5	1.5	1.2

When making the design on the basis of an elasto-plastic operating condition, computation of the internal force can be made according to a specially drawn chart or program. However, it is also possible to make an analysis according to the given load (2-4-3 in the note) and the method of elastic static force.

2-4-9. When designing reinforced concrete structural parts, the following requirements should be met:

a. The distribution rate of drawn steel bars generally does not exceed 1.5 percent. When it is necessary to exceed this percentage, the [β] value of the bent structural parts must satisfy the followings:

$$[\beta] \quad \frac{0.5}{x/h_o} \qquad (2\text{-}3)$$

where x--height (cm) of concrete compressed zone

h--effective height (cm) of cross-section

b. Regarding the continuous beam support, frame, and rigid panel point, when checking the sectional shearing strength, the designed strength R_{ad} value of concrete axial compressive motive force must be multiplied by the reducing coefficient 0.8, and the distribution rate of looped steel bars μ_K should not be lower than 0.15 percent. The sum of the distribution rate μ_1 of steel bars under tension in the span of structural parts and the distribution rate μ_2 of support steel bars under tension (when the distribution rate of support steel bars on both ends are unequal, take the average value μ_2) must be satisfied.

$$\mu_1 + \mu_2 < 0.3 \frac{R_{ad}}{R_{gd}} \qquad (2\text{-}4)$$

where R_{gd}--designed strength (kg/cm^2)

c. Use sealed, fastened steel bars where the drawn steel bars are lapped and anchored. The distance between fastened steel bars should not be greater than 5 times the diameter of the main steel bars.

2-4-10. When designing the structure according to the operating stage, the following methods should be adopted in order to take the value of action force transmitted from the roof covering pillars and bar-shaped foundations.

a. When the wall and pillar are under major off-center stress, take 1.25 times the support reaction value of the roof covering under the simultaneous actions of equivalent static load and static load (rock, earth pressure, and structural weight).

b. When the wall and pillar are under minor off-center stress or axial stress, take 1.25 times the support reaction value of the roof covering under the simultaneous actions of equivalent static load and static load.

c. For the action force transmitted to the bar-shaped foundation, take the force borne by the wall and pillar and add the weight of the wall and pillar.

2-4-11. When designing the bar-shaped foundation and single pillar foundation, for the allowable soil load-bearing force, take the numerical value of static load in action and multiply the increasing coefficient listed in Table 2-6.

Table 2-6. Increasing coefficient of allowable soil load-bearing force

Soil Classification	Increasing coefficient
Pebble and dense, hard plastic subclay	5
Dense subclay	4
Fine sand of medium or greater density	3
Powdered sand of medium or greater density, Plasticable or soft subclay of medium density	2

2-4-12. When designing the structural cross-section, adopt the design method under the action of the static load. However, for the designed safety coefficient of structural parts, take the safety coefficient (Table 2-7) under the condition of static force and multiply it with 0.7 (Take 1 should the product be less than 1). For the dynamic strength of materials, take the static strength and multiply it with the coefficient listed in Table 2-1 of Chapter 11.

2-4-13. For the structural parts of brittle materials under major off-center tension and under the simultaneous actions of dynamic load or dynamic and static loads, when making the design on the basis of tensile strength control, the distance between eccentric loads may not be limited. Take 0.95y for the limited value of load eccentric distance when making the design in accordance with tensile strength control.

Note: y--the distance from the sectional center of gravity to the sectional edge where the longitudinal force is located.

Table 2-7. Designed Safety Coefficient of Structural Parts' Static Strength

Structural Classification	Tension Characteristics	Safety Coefficient
Reinforced concrete	Axial tension, bent, eccentric compression members	1.40
	Axial compression, eccentric compression, partial pressure-bearing, inclined cross-sectional shearing, torsion	1.55
Concrete	Tension members based on the calculation of pressure-resisting intensity and tension members based on the calculation of pressure-resisting intensity, partial pressure bearing	1.65
	Members under pressure and bending according to the calculation of pressure-resisting intensity	2.65
Bricks, masonry products	Under pressure	2.30
	Bending, tension, and shearing	2.50

Section 5. Structural Requirements

(I) General Specifications

2-5-1. The designations of building materials used for tunnel structures should not be lower than the specifications cited in Table 2-8.

Table 2-8. The Lowest Designations of Building Materials

建筑材料 (2) 工程部位 (1)	砌体 (3)				混凝土 (4)		钢筋混凝土 (5)		喷射水 (6)
	砖 (7)	石材 (8)	混凝土砌块 (9)	水泥砂浆 (10)	现浇 (11)	喷射 (12)	现浇 (11)	预制 (13)	
拱圈、顶板 (14)	100	300	150	75	150	200	150	200	100
侧墙 (15)	100	300	150	50	150	200	150	200	100

Key:
(1) Engineering location
(2) Building materials
(3) masonry products
(4) concrete
(5) reinforced concrete
(6) sprayed cement mortar
(7) brick
(8) stone material
(9) concrete block
(10) cement mortar
(11) in situ
(12) sprayed
(13) prefab
(14) arched ring roof plate
(15) side wall

2-5-2. Reinforced concrete structure taking dynamic load must conform to the following requirements:

a. Minimum net protective layer

(1) The inner layer of reinforced concrete structure poured on the spot is 2 cm and the outside layer (surface in contact with the enclosing rock) is 3 cm. Both the inner and outer layers of assembled parts are 1.5-2 cm.

(2) When there are actions of corrosive media, the protective layer of the outer layer should be appropriately thickened.

b. Steel bars should be distributed on both surfaces on the reinforced concrete arch or straight wall arch. The diameter of steel bars under stress should not be smaller than 8 mm and the distance (space) should not be greater than 250 mm.

c. The stress-bearing steel bars of reinforced concrete beams and plates should not be smaller than 8 mm. The reinforcing steel bars should be based on 5-10 percent of the tension-bearing arrangement with the diameter being not less than 6 mm and spacing not greater than 300 mm. No less than 0.2 percent of structural steel rods should be arranged in the pressure-bearing zone of beams and plates. The diameter of looped steel rods should not be less than 6 mm and spacing should not be greater than 200 mm.

d. The diameter of longitudinal tension-bearing steel bars for reinforcing concrete pillars should not be smaller than 12 mm. The distribution rate of all the longitudinal steel bars should not exceed 2.5 percent. The diameter of looped steel rods should not be smaller than 6 mm and the spacing should not be greater than 300 mm and, at the same time, it (spacing) should not be greater than 15d in the fastened frames. In welded frames, the diameter should not be greater than 20d (d is the smallest diameter of longitudinal reinforcing steel rod).

e. The minimum distribution rate of steel bars for reinforced concrete structural parts may be taken from Table 2-9.

Table 2-9. Minimum Steel Bar Distribution Rate (%) of Reinforced Concrete Structural Parts

	Concrete Numbers		
Classification	_ 200	250-400	500-600
All pressure-bearing steel rods of axial pressure-bearing parts	0.4	0.4	0.4
Pressure-bearing steel rods of eccentric pressure-bearing parts	0.2	0.2	0.2
Tension steel rods of bending members eccentric pressure and eccentric tension parts	0.15	0.2	0.2

f. Use welded joints for tension steel bars. When the steel rods are connected by fastering, stagger the joints and avoid placing the joints in location where there is maximum pressure. The percentage of the section occupied by the stress steel bars with joints in relation to the total area occupied by stress steel bars is as follows: in tension area, it should not exceed 25 percent and in pressure area, it should not be greater than 50 percent.

g. In the tension zone, the lengths of lap joints of steel rods and of anchorings should not be less than 30d. In the pressure area, they should not be less than 20d.

(II) Exit-Entrance Passageways

2-5-3. The following strengthening measures must be adopted in connection with exit-entrance passageways:

a. Reinforced concrete covering (linings) structures should be employed within 2-3 meters in front of the protective airtight doors and the anti-gas passageway behind the doors (See Figure 2-1) and should be built together with the door framewall. The structural section are 5-10 cm thicker than the main structure with corresponding forces of resistance. Steel rods are distributed on both surfaces of the section. Steel rod distribution in the pressure zone should not be less than 1/3 and not less than 0.2 percent of the steel rods in the tension section.

b. In-situ concrete may be employed on passageway structures 2-3 meters in front and outside the airtight doors. For tunnels with sectional thickness not less than 30 cm and with a capability of resisting an ultra pressure of 1 kg/cm^2 from the shock waves of a nuclear explosion. For tunnels capable of resisting an ultra pressure of 3 kg/cm^2 from shock waves of a nuclear explosion and the sectional thickness of which is less than 3 cm, use reinforced concrete. The sectional thickness should not be less than 40 cm.

c. The overbreaks must be completely and compactly backfilled.

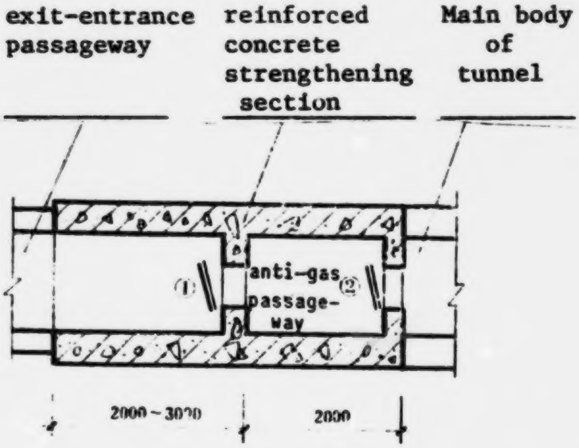


Figure 2-1. Strengthening "limits" in front and in back of the protective airtight doors

Note: (1) in the figure is the protective airtight door;
(2) airtight door

(III) Panel Point of Dynamic Structure

2-5-4. As to masonry block (or concrete) wall [and] reinforced concrete pre-fabricated arched structures, use mortar No 75 or higher for masonry work. For the wall tops, use No. 100 mortar as base mortar. Adopt the following steps for the location of the arch base.

a. Expand the arch base dimensions.

b. Install reinforced concrete cushion beams (Figure 2-2). The height should not be lower than 20 cm. The width is the same as the wall thickness. The reinforcing rods should not be fewer than 6 steel rods 12 mm in diameter.

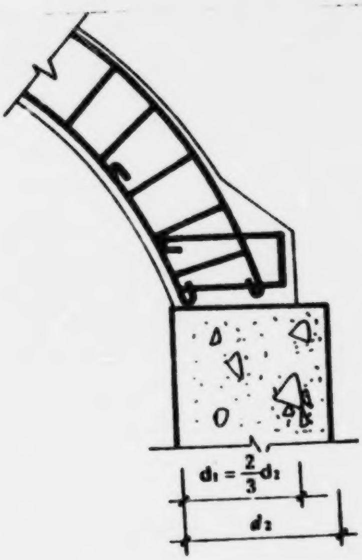


Figure 2.2. Dimensions of Expanded Arch Base

2-5-5. The requirements of nodal (panel) structure of reinforced concrete frame structure.

a. As to the terminal nodal (panel) point where the roof beam (plate) and pillar (wall) intersect (Figure 2-3), when based on rigid design, it is generally tension bearing at an outer refraction angle and pressure bearing at an inner refraction angle, and it is necessary to use welded joints. When fastened joints are used, there should be one steel rod every 10 cm among the longitudinal reinforcing steel bars in the pillar (wall), which extends to inside the roof beam (plate) and extends after being bent. The pressure reinforcing steel rods or bars on the upper layer of the roof beam (plate) should be bent and extended to inside the pillar (wall). The pressure rods are not allowed to have kinks at an inside bending angle or direct joints.

Under the effects of vibrating load, it is possible that tensile stress may appear at the inside bending angle. Therefore, extra steel bars with diameter smaller than 12 mm and spaced not more than 300 mm may be added to structures with bigger spans. A suitable number of looped bars may also be installed.

b. Regarding the intermediate panel point where the pillar (wall) and roof beam (plate) intersect, when the span of roof beam (plate) is fairly large, supports and extra reinforcing bars may be installed. (Figure 2-4)

Note: When the net span of a single span is less than 5 meters, extra bars may not be installed.

2-5-6. Outer layer steel bars of continuous arch must be bent and extended to inside the pillar (Figure 2-5).

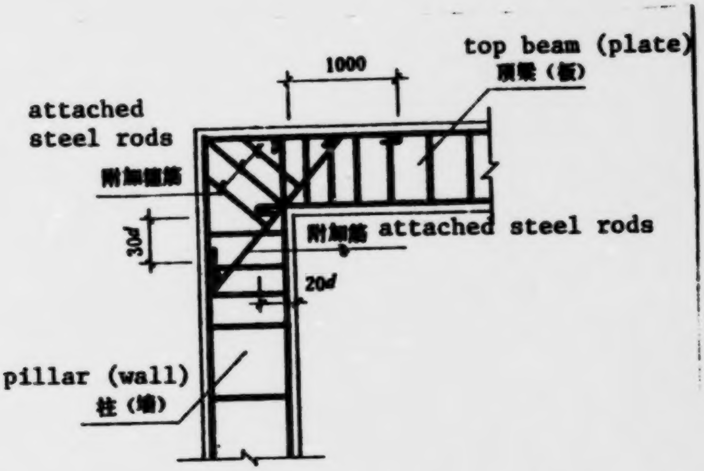

1000
top beam (plate)
顶梁（板）
attached
steel rods
附加箍筋
30d
附加筋 attached steel rods
20d
pillar (wall)
柱（墙）

Figure 2-3. Panel point structure of framed end

2-5-7. When building a masonry (or concrete) wall reinforced concrete hyperbolic flat shall roof structure, the following requirements must be met:

a. Steel bars are distributed by zone on the shell plate. Employ orthogonal reinforced meshes on the upper and lower layers and install inclined steel bars at the corners.

b. Within the limit that the parts (members) near the edge around the shell plate are not less than 1/12-1/10 the length of the shell's short side, it is necessary to gradually increase the thickness according to the magnitude of the internal force at the location. All the steel bars of the upper and lower layers must be anchored into the edge members.

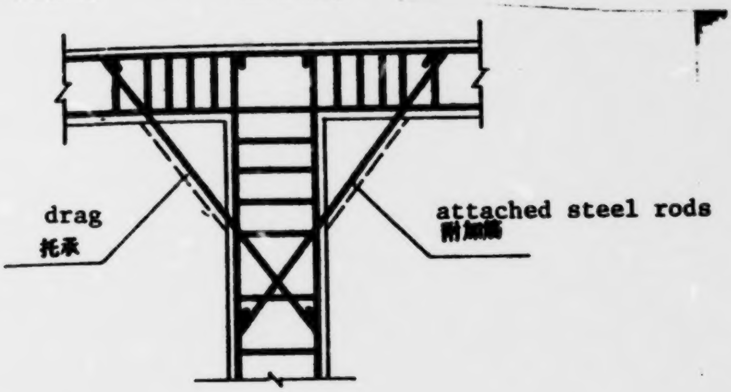

drag
托承
attached steel rods
附加筋

Figure 2-4. The frame's middle panel point structure when the span is fairly large

c. In addition to installing the main stress steel bars for the edge members, it is necessary to install torsional sealed looped steel bars.

d. The end panel point structure of edge member is illustrated in Figure 2-6. The stress steel bars where the ends of two edge members intersect should be lapped joint and extended beyond the edges of supports no less than 30 times the diameter of the steel bars. If required, use welded joints.

e. At the connecting point where the two edge members intersect, employ reinforced concrete pillars as supports.

f. As to tunnels capable of resisting ultra pressure of 1 kg/cm² from shock waves of a nuclear explosion, the thickness of masonry wall should not be less than 60 cm and the thickness of in-situ concrete wall should not be less than 40 cm.

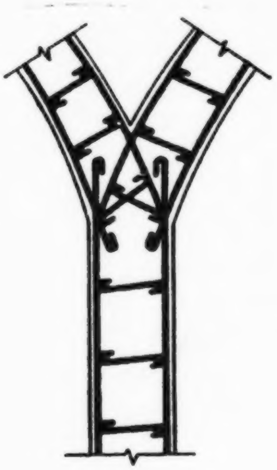


Figure 2-5. Middle panel point structure of continuous arch

g. Wall and shell top must be compactly backfilled.

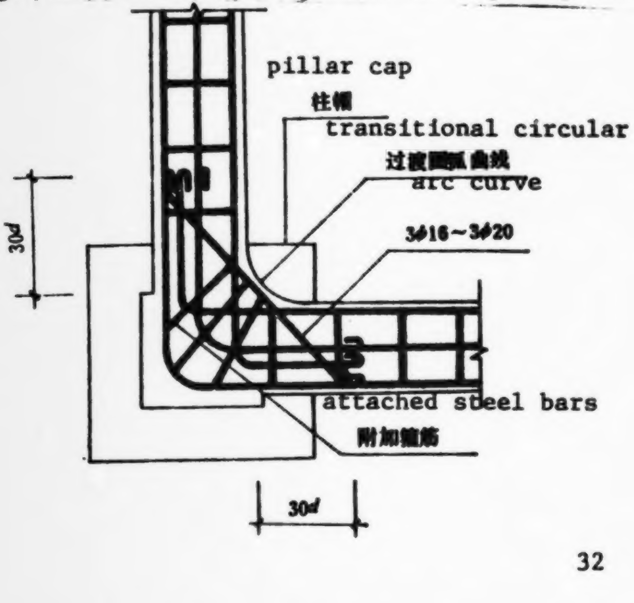


Figure 2-6. Edge beam end's panel point structure

IV. Settling and Expansion Seams

2-5-8. The installation of settling seams should be considered in the following situations, tunnels, tunnel fortifications, and dug-out structures:

a. At the intersection of in-earth solid-type head tunnel and the dynamic covering section;

b. At the intersection of soil and solid rock layer, or location where there is a big difference between hard and soft soil;

c. In location where the earthquake zone with seismic magnitude of grade 8 or greater going through the faults;

d. In river-crossing section that goes through river bed;

e. In places where there are big differences in the span, height, or tunnel load of in-earth tunnel structures;

f. In the soft and weak soft layer (such as silt earth), joint between exit-entrance passageways and the main body, and when the lateral length of tunnel is comparatively long.

2-5-9. Expansion joints should be installed on underground solid in-situ concrete or reinforced concrete structures. See Table 2-10 for spacing. However, expansion joint should not be installed if the following situations exist:

a. When dependable measures (such as arranging temperature reinforcement) have been taken during planning and construction;

b. When the internal temperature differentials of tunnel and tunnel fortifications are not great;

c. Material rocks, prefabricated concrete slabs, and assembled type reinforced concrete structures.

Table 2-10. Maximum Spacing of Expansion Joints (In Meters)

Structure Classification	Spacing
Non-reinforced concrete	20
Structural steel reinforced concrete	30
Cast-in-situ reinforced concrete	30

Note: (1) With practical experience or having taken the necessary measures, it is possible to appropriately increase the spacing.

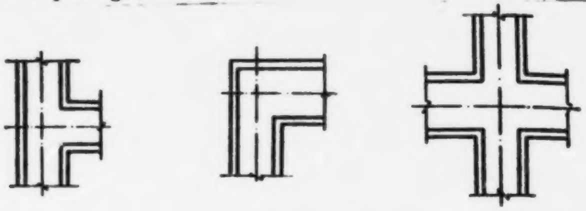
(2) The spacing of expansion seams of tunnel and tunnel fortifications structures should be reduced by 3-10 meters in accordance with the values listed in the table.

2-5-10. Considerations must be given to the coordination of the settling, expansion, and construction seams and these seams must be located in the dry sections. If they are arranged in the seepage section, water-proof treatment must be given. If they are arranged in the anti-gas airtight section, anti-gas treatment must also be given.

(V) Tunnel Joints

2-5-11. Joints of tunnels and tunnel fortifications and strengthening measures

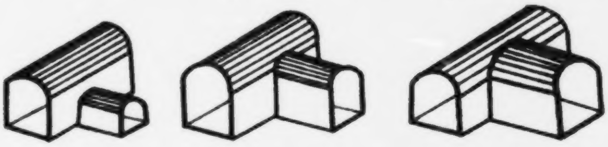
a. The plane type of joints comes in T-shape, L-shape and +-shape (Figure 2-7). Avoid adopting +-shaped joints.



丁字形 T-shape　L形 L-shape　十字形 +-shape

Figure 2-7. Plane type of joints

According to the difference in the span and height of sidewall, the joints may take the forms of sidewall intersecting, arch-semi-intersecting, and arch-plane intersecting (Figure 2-8). If the application requirements can be met, avoid arch plane intersecting and arch semi-intersecting as much as possible.



侧墙相交 Sidewall intersecting　拱部半交 Arch semi-intersecting　拱部平交 Arch plane-intersecting

Figure 2-8. Types of joint intersecting

b. Avoid plane-inclined intersecting type of joints. When this is unavoidable, the intersecting angle "a" should not be less than 60° (Figure 2-9).

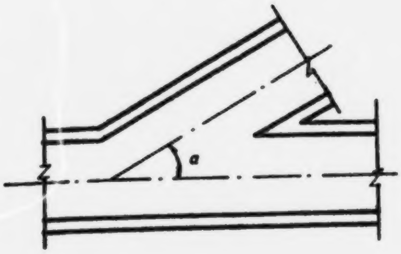


Figure 2-9. Plane-inclined intersecting joint

c. The joints should be arranged in area with good geological conditions. On the basis of the concrete conditions, separately adopt the following strengthening measures.

(1) Properly increase the material grade of the joint position.

(2) Appropriately increase the steel bar distribution rate for the joint position of reinforced concrete covering.

(3) With respect to concrete coverings, when the space is fairly large, it is possible to employ structural steel bars in accordance with 0.2-0.3 percent of steel bar distribution rate. When the span is smaller, it is possible to increase the thickness of the arch and sidewall structures having bigger spans by 5-10 cm. The concrete grade should not be lower than No. 200, and the limit of added thickness (Figure 2-10) is as follows:

When the large span of two intersecting "pores" is within 3 meters;

S = 1.0 meters

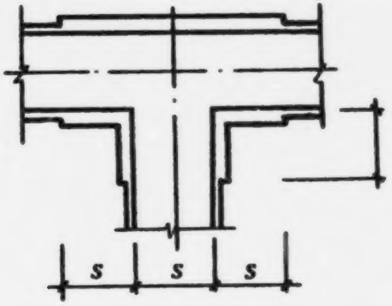


Figure 2-10. Thickening limit of tunnel joint

When the large span of two intersecting "pores" is 4 meters

S = 3.0 meters

c. The joint position of prefabricated-reinforced-concrete-member covering can be changed to in-situ pouring.

(VI) Partition Thickness and Backfill

2-5-12. The thickness of the walls of passageways (rooms) adjacent or parallel to tunnels or tunnel fortifications should be in accordance with table 2-11.

Table 2-11. Partition Thickness

Rock Classification	Partition Thickness
Class I enclosing rock	10-1.5 times larger "pore" span, but not less than 4 meters
Class (II-III_1) enclosing rock	1.5-2.0 times larger "pore" span, but not less than 6 meters
Class(III_2-III_3)enclosing rock, old loess or hard plastic clay	2.0-3.0 times larger "pore" span, but not less than 8 meters
Class IV enclosing rock, new loess, plasticable clay, slightly moist to moist, nonclay	3.0-5.0 times larger "pore" span
Class V enclosing rock, soft plastic-shaped clay, moist powdered sand	greater than 5 times larger "pore" span

Note: (1) I, II, III, IV, V in parentheses listed in the table denote classification of rocks. See Table 2-12.

(2) Rooms on both sides of the passageway should be staggered. The staggered distance may take 0.5-1.0 times the partition thickness.

2-5-13. Backfills outside the covering should conform to the following requirements:

a. Tunnel and tunnel fortifications in rocks

1. The same grade of concrete, rubble concrete, or snecked rubble blocks is used for the arch rings to firmly backfill the arch base position.

2. Arch rings and sidewalls should be backfilled firmly.

3. Tunnel joints and exit-entrance passageway structures must be totally and firmly backfilled.

b. Tunnels in earth, tunnel fortifications and dugouts must be firmly backfilled. For the arch base of masonry wall reinforced-concrete-prefabricated-arch or straight wall arch top structure, low grade concrete, rubble concrete, irregular rubbles or [3]three-seven" plaster should be used as backfill materials.

c. Tunnels build in earthquake areas to withstand the magnitude of grade 8 or greater must be completely and firmly backfilled.

Note: This specification is inapplicable to partition wall coverings.

Section 6. Gunite Supports

(I) General Specifications

2-6-1. Gunite supports are suitable for use in tunnel fortifications and civil defense tunnel projects. When facing the following geological conditions, gunite supports may be employed after testing and adopting reliable measures.

a. Rocks having strong expansion pressure from a large area of drenched water, an area partly covered with gushing water, or unexpected water

b. Clay with plentiful underground water, subclay, and loess, and all kinds of argillaceous rocks

c. Section where enclosing rocks or underground water cause serious corrosion to concrete.

2-6-2. As to tunnels and tunnel fortifications, when gunite support is used, employ explosions to "smooth the surface" and build supports in good time.

2-6-3. When using gunite support for dynamic coverings, do not use gunite support alone.

(II) Support Designs

2-6-4. The types of gunite supports and support parameters are determined by the geology, tunnel cross-section dimensions and construction techniques and other conditions where the project is located through project analogy and the necessary computations. Table 2-13 may be used for tunnels with span less than 15 meters.

2-6-5. For projects having large spans, when the stability requirements cannot be met by using ordinary gunite supports, use large pre-stressed anchor rods to strengthen the gunite supports.

2-6-6. When the span of dynamic covering is less than 6 meters, use gunite concrete support with less than 50 mm in thickness for Type II enclosing rocks. Enclosing rocks of Types III, IV and V may be used in accordance with Table 2-13. However, the thickness of gunite concrete must be increased by 20-50 mm.

Table 2-12. Classification Table of Enclosing Rocks

Classification			Characteristics of Rock Structure	Rock saturation compression strength kg/cm^2	Underground water effects
	Type	Name			
	I	Complete hard rocks	Rocks are complete. Structural surface does not have unstable combination, shows no weathering phenomenon, and is not susceptible to weathering.	$\geq$ 800	Effects of underground water on enclosing rock stability may not be considered.
II	II_1	Complete medium hard rocks	Rocks are complete. Soft structural surface does not have unstable combination. There is virtually no weathering phenomenon and is not susceptible to weathering.	300-800	Generally effects of underground water on enclosing rock stability may not be considered
	II_2	block-shaped hard rocks	Block-shaped structure appears. Most cracks are closed and dirt not attached. Soft structural surface does not have unstable combination. Rocks may be weathered	> 600	
III	III_1	Complete, soft rocks	Rocks are complete. Rocks are not decayed or weathered or partly weathered slightly.	150-300	When underground water causes soft rocks or crack fillings to soften or when water pressure affects rock stability, it may be placed under Type IV. If the effects on rock stability are too great, it may not be necessary to lower the classification, and the enclosing rock value may be appropriately increased.
	III_2	block-shaped medium hard rocks	Block-shaped structure. Most medium hard rock cracks are closed. There are no dirt fillings. A part of hard rock cracks is open and have dirt fillings. A part of the soft structure surface has unstable combination and shows slight decay.	> 300	
	III_3	cataclastic	Cataclastic structure, but most medium hard rock cracks are closed, and have no dirt fillings. A part of the soft structure has no unstable combination. It is possible to have slight and weak decay.	> 600	
	IV_1	block-shaped	Block-shaped structure appears. Soft rock cracks do not have dirt fillings, while hard rock cracks have dirt fillings. The soft structural surface does not have unstable combination and may have slight and weak decay.	100-300	When above-cited situation in which water exists, the classification may be lowered to V.

Stable conditions of "pore" enclosing rocks	Enclosing rock pressure (ton/m^2)			Representative rock samples
	Perpendicular pressure	Water level pressure	Theory of computing rock mechanics	
Span $\leq$ 15 meters unsupported "pore" enclosing rock stability	not considered	not considered	elasticity theory	granite, dioritic rocks, andesite basalt, limestone, [ferrosilicon cement, sand rock], bibbley-rock, marble, gneiss, and quartzite
Span < 10 meters unsupported "pore" is basically stable. Sidewall does not have sliding objects. In Type II$_2$, the "pore" roof or top in individual zone may have small falling rocks.	In Type II$_1$, L 10 meters may not be considered. Under other conditions, take (0.05-0.01) Ly	not considered	Theory of elasticitv of theory of elasticity-plasticity	Lime cement sand rock, rubble rock, sand shale limestones, dolomite, quartz, glimmerite, and Type I rocks that are slightly weathered or poorly cemented.
				Type I rocks which are considerably cracked or slightly weathered
Span < 5 meters, unsupported "pore" enclosing rocks are basically stable. In area where the combination of individual soft structural surface is unstable, it is possible that a small number of falling rocks may appear	III$_1$ L 5m may not be considered. For other conditions, take (0.1-02) $x(L+\frac{H}{2})y$	(0-0.15)q	Use the theory of elasticity to compute the pressure of enclosing rocks; use the block form equilibrium method to determine a part of the falling rock load.	complete lime-argillaceous cement sand rocks, rubble rocks, and sandy shales
		(0.15-0.25)$_q$		Cracks (openings) are well developed. There are weak, weathered rocks under Type I or slightly weathered rocks under Type II.
			Theory of non-cohesion or theory of elasticity and plasticity	Cracks are fairly well developed. Cracks are closed and rocks with no dirt attached and weak and weathered rocks under Type I.
Span < 5 meters unsupported "rubble hole" enclosing rocks are unstable. Collapse and destruction may occur, but will not extrude, crush. Must be supported during construction period.	(0.3-0.4) x $(L+\frac{H}{2})y$	(0.25 - 0.4)$_q$		Cracks are fairly developed. Most of the sandy rocks with lime soil cement, bibbley-rock, sandy shales, and cracks are filled with dirt. Severely weathered rocks under Types I and II.

Taboe 2-12 (Continued)

VI_2 cataclastic, medium hard rocks	Cataclastic structure appears. Cracks are open, and most of them have dirt fillings. There are many soft structural surfaces and the combinations are unstable. Most of the rocks are severely decayed or weathered.	> 300	
V yolk	Non-cohesive structure appears. Hard rocks are severely weathered, dirt-imbedded. Soft rocks are slacking. Openings or cracks are completely filled with dirt.	> 100	When saturated, compute the enclosing rock pressure according to height of the water-saturated rock piller or height of the complete rock pillar.

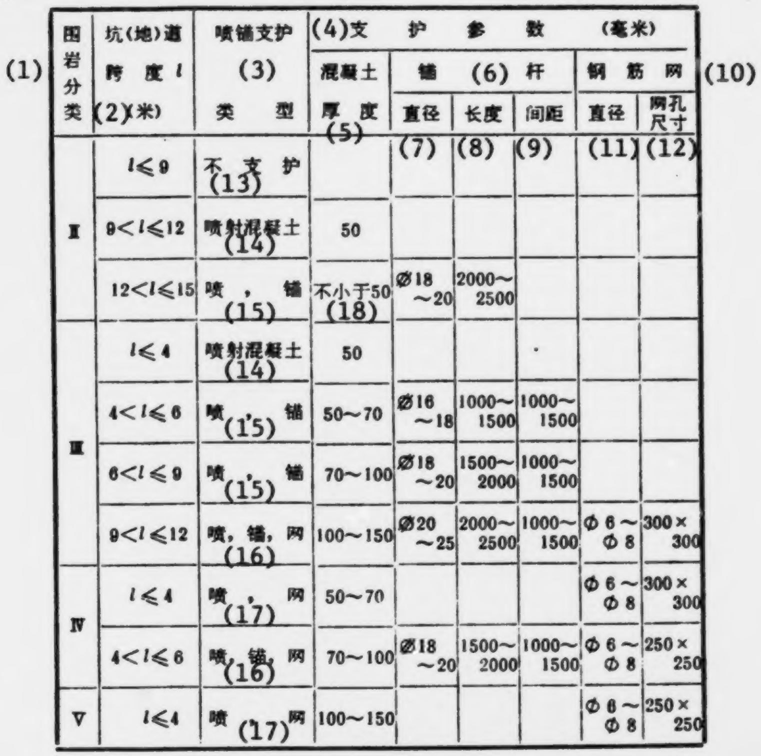
Note: (1) in the table, L--"rubble hole" span (m),
H--"rubble hole" height (m)
y--rock/volume/weight (ton/m^2)

(2) The perpendicular pressure q and water pressure e denote the average distribution pressure of the total span and total height along the tunnel.

(3) In the pressure computation formula, the weight of backfills (from excessive excavation) is not included.

			Rocks with fairly developed cracks under Type II and all kinds of rocks with well developed cracks that are filled with dirt or severely weathered.
Span < 3 meters Supports must be close together during construction period.	$\geq 0.55 \times (L + \frac{H}{2})y$	$\geq 0.4q$	Severely weathered rocks layered with earth, fractured zone of rocks layered with dirt, unusually crushed or soft argillaceous shales and coal seams

Table 2-13. Types of Gunite Support and Support Parameters



围岩分类 (1)	坑(地)道跨度 l (2)(米)	喷锚支护 (3) 类型	(4)支护参数 (毫米)					
			混凝土	锚 (6) 杆			钢筋网 (10)	
			厚度 (5)	直径 (7)	长度 (8)	间距 (9)	直径 (11)	网孔尺寸 (12)
Ⅱ	l≤9	不支护 (13)						
	9<l≤12	喷射混凝土 (14)	50					
	12<l≤15	喷，锚 (15)	不小于50 (18)	Ø18～20	2000～2500			
Ⅲ	l≤4	喷射混凝土 (14)	50					
	4<l≤6	喷，锚 (15)	50～70	Ø16～18	1000～1500	1000～1500		
	6<l≤9	喷，锚 (15)	70～100	Ø18～20	1500～2000	1000～1500		
	9<l≤12	喷，锚，网 (16)	100～150	Ø20～25	2000～2500	1000～1500	Φ6～Φ8	300×300
Ⅳ	l≤4	喷，网 (17)	50～70				Φ6～Φ8	300×300
	4<l≤6	喷，锚，网 (16)	70～100	Ø18～20	1500～2000	1000～1500	Φ6～Φ8	250×250
Ⅴ	l≤4	喷 网 (17)	100～150				Φ6～Φ8	250×250

Note:
(1) See Table 2-12 for classification of enclosing rocks
(2) No. 100 mortar is generally used for injecting into anchor bars.
(3) For ones without support, spray 20 mm cement mortar to prevent weathering.
(4) Diameter and length are listed, but spacing dimensions are not. Use anchor bars to support depending on the concrete conditions.
(5) Properly add bresssummers or steel frames to $\ell \leq 4$ meter sprayed and meshed structures and Type V enclosing rocks.

Key:	
(1)	Enclosing rock classification
(2)	Tunnel Span (m)
(3)	Gunite Support Type
(4)	Support Parameters (mm)
(5)	Concrete thickness
(6)	Anchor rod
(7)	Diameter
(8)	Length
(9)	Space
(10)	Reinforced mesh
(11)	Diameter
(12)	Reinforced mesh hole size
(13)	Unsupported
(14)	Sprayed concrete
(15)	Sprayed, anchored
(16)	Sprayed, anchored meshed
(17)	Sprayed, meshed
(18)	not less than

CHAPTER III. PROTECTION OF OPENINGS

Section 1. General Specifications

3-1-1. According to the differences in resistance, take corresponding protective and airtight measures on openings used as exits and entrances for civil defense project personnel and equipment, air inlets and outlets, and smoke exhausts.

3-1-2. The resistance of protective and airtight equipment must be determined by such factors as tunnel's resistance, type of opening, and place where the equipment is located. The resistance of protective and airtight doors must be 1 to 2 times greater than the corresponding tunnel projects. The designed load of locks and hinges [straps] should be determined by the pressure taken by the door leaf from the shock waves.

3-1-3. The designs of protective airtight equipment must conform to such requirements as being light and flexible, safe, reliable, structurally simple, and easy to make, maintain, and repair.

3-1-4. Reinforced concrete or other lightweight and high-strength materials should be used for manufacturing protective airtight equipment and airtight doors. The structure may be arch or surface plate in shape. In-situ reinforced concrete structure should be used on door frame wall to insure that no major displacement would occur under the action of thrust. In-situ concrete structure should be used on door frame wall of airtight doors. The wall thickness is generally 25-30 cm.

Aluminum alloy materials are used for valve plates. Rolled steel may also be used. Steel structure should be used for the base.

3-1-5. The increasing coefficients of material strength under the effects of shock waves from a nuclear explosion are: reinforcing steel plate, 1.1-1.2. Aluminum alloy is not under consideration.

Strength increase is generally not considered in materials for making locks, door leaves, and airtight doors.

3-1-6. Products of finalized designs should be used for protective airtight equipment.

3-1-7. When there is a possibility that the first door of some of the main entrances may be blocked, an emergency door leaf opening mechanism must be installed.

Section 2. Protective Airtight Doors

(I) Structural Requirements of Door Leaf

3-2-1. The net spacing of tension steel bars for reinforced concrete door leaf should not be less than the diameter of the steel bar, and also must not be less than 25 mm. The net thickness of protective layer should not be less than 10 mm in relation to the reinforced concrete door leaf. For steel mesh-reinforced concrete door, it generally takes 2-4 mm.

3-2-2. The length of anchor extending into the support of the tension steel bars of reinforced concrete flat slab door leaf should be consistent with the "Regulations Governing the Designs of Reinforced Concrete Structures" currently in force. If the length of the steel bars in door leaf pressure edge is not long enough, bend the steel bar and make a hook at the end (Figure 3-1).

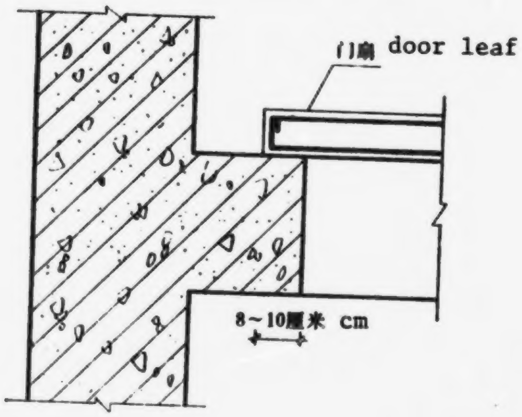


Figure 3-1. Anchor on the support of door leaf's steel bars under stress

3-2-3. For door leaf of reinforced concrete round arch door with a span not greater than 150 cm and reinforced concrete round arch door's leaf calculated on the basis of double-hinged arch, select the cross-section and symmetrical reinforcing steel bars on the basis of the maximum internal force, and use shaped steel to rim the two sides of the door leaf (Figure 3-2) or adopt other strengthening measures. Every other lateral steel bar of the inside and outside layers should be welded to the rimmed shaped steel.

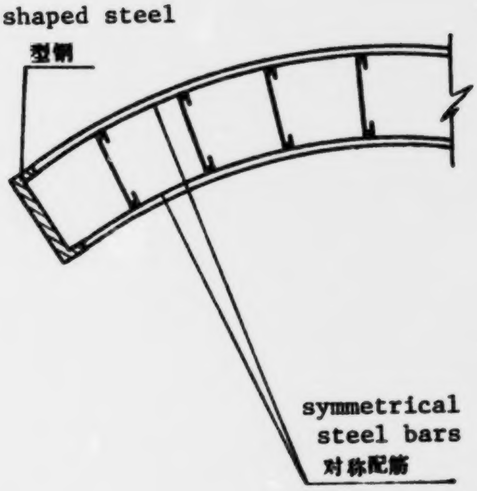


Figure 3-2. Steel bars for round arch door's leaf

3-2-4. Sealed strip fillisters must be pre-installed on protective airtight door leaf to insure that the door leaf and door frame will be kept close together when the sealing strips reach the designed compression capacity.

3-2-5. The joint of door frame and door frame wall must have sufficient anchoring steel.

3-2-6. The dimensions of protective airtight door, airtight door, and protective airtight cover are generally selected from Table 3-1 or are determined according to actual needs.

Table 3-1. Types and Dimensions of Doors

Door type	Dimensions (cm)
Protective airtight door	80 x 180 110 x 180 130 x 180
Airtight door	80 x 180 110 x 180 130 x 180
Protective airtight cover	50 x 70

Note: Door leaf pressure edge not included

(II) Locks and Hinged Leaf

3-2-7. Locks and hinged leaf are generally calculated on the basis of mechanical part designs.

3-2-8. Airtight measures must be taken in connection with the lock mechanism of airtight doors and protective airtight doors to meet the airtight requirements of door leaf.

3-2-9. Make sure that lock and hinged leaf will insure the proper opening and closing of door leaf. Lock and hinged leaf must be equipped with adjusting, tightening, and lubricating mechanisms. Make certain that effects of the positive pressure from shock waves transmitted from the door leaf will be prevented.

Internal and external control switches are generally installed in the locks. Locating devices are also installed.

(III) Door Frame Wall

3-2-10. The structure of door frame wall for protective airtight door must conform to the following requirements:

a. For the door frame wall of flat slab door, lateral tension steel bars and [erected] steel bars (Figure 3-3) should be installed on the left and right sides of the door way. The percentage of lateral tension steel bars on each surface should not be less than 0.25 percent. The diameter should be less than 10 mm and spacing not greater than 250 mm. Also, make bands (not threaded steel). The diameter of [erected] steel bar should not be smaller than 10 mm.

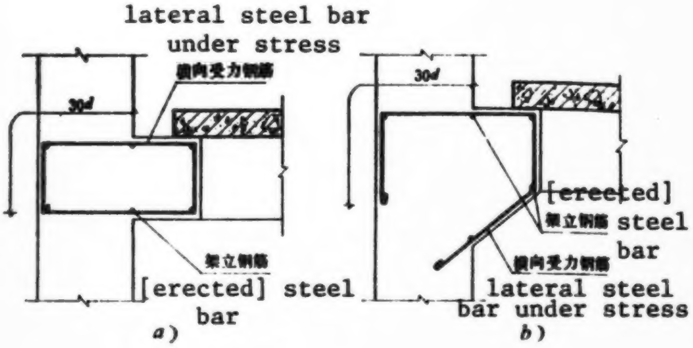


Figure 3-3. Flat slab door's frame wall

(a) suspended arm beam (b) bracket

b. With respect to the frame wall of round arch door, when the left and right sides of the door way conform to $\frac{N}{2C}$ R_{ad} (Figure 3-4), the structure should meet the following requirements:

(1) $h_k \geq \frac{1}{3}h$, and should not be less than 200 mm;

(2) The diameter of the lateral tension steel bar should not be smaller than 12 mm and spacing not greater than 200 mm;

(3) The diameter of [erected] steel bars should not be smaller than 10 mm and spacing not greater than 250 mm;

(4) The diameter of joint steel bars should not be smaller than 6 mm and spacing not greater than 200 mm.

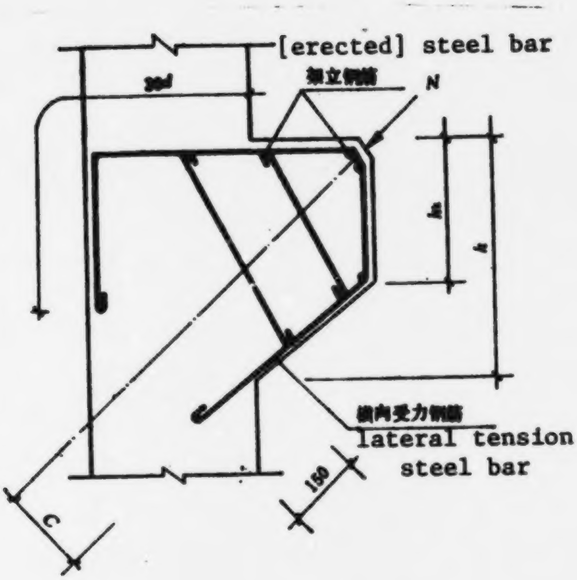


Figure 3-4. Door frame wall bracket of round arch door

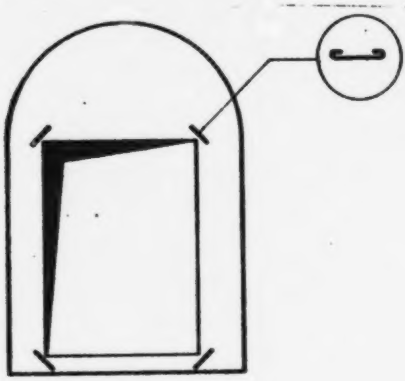


Figure 3-5. Inclined reinforcing bars at 4 corners of door way

c. Reinforcing bars for the retaining wall above the door way should be computed. However, the percentage of reinforcing bars for the outer layer should not be less than 0.25 percent; diameter of steel bar not smaller than 10 mm; and spacing not greater than 250 mm.

d. Inclined reinforcing steel bars with 16 mm-diameter should be installed at the four corners of the inside and outside layers of the door way. The length should not be less than 60 times the steel bar diameter (Figure 3-5).

e. The grade of concrete should not be lower than No. 250, No. 300 is generally used. The thickness is determined by computation, but for tunnel with a resistance of 1 kg/cm^2, it should not be less than 300 mm. For tunnel with a resistance of 3 kg/cm^2, the thickness should not be less than 400 mm.

Note: N--is the resultant forces (kg/cm) of the equivalent static load from the thrust along the unit length of each side of the door way.

C--is the perpendicular distance (cm) from the corner (point) under the bracket's inclined side to N extension line.

R_{ad}--concrete axial resistance of forces ($kg.cm^2$) under the action of dynamic load.

3-2-11. Structural joints of frame walls of the protective airtight doors and exit-entrances of the passageway must conform to the following requirements:

a. When concrete or reinforced concrete in-block coverings for the passageway are used, the door frame wall must be built together with the coverings, and the length where the tension steel bar extends into the passageway structure must not be less than 30 times the steel-bar-diameter. Should the length extending into a fairly thin structure be insufficient, it is possible to bend the steel bar 90° and make the end into a hook (Figure 3-3). The lower part of the door frame should be imbedded 300 mm below the passageway's base plate surface.

b. Use concrete, rubble concrete or rubble masonry brocks with backfills in the space between the passageway covering and "pores" of the tunnel and tunnel fortifications.

3-2-12. Joints of airtight door frame walls and the tunnel's exit-entrance structure must meet the anti-gas and airtight requirements. When concrete or reinforced concrete in-block coverings for the passageway are used for the passageway, the door frame must be built together with the [coverings].

3-2-13. Use shaped steel or reinforced concrete prefabricated door frames for airtight doors and protective airtight doors. The door leaf and frame of round arch door must be fitted together during the manufacturing process, making sure that they are level and tight. Steps should be taken to insure that they are secure and airtight.

Section 3. Suspended Plate-Type Valve

(I) Structural Design

3-3-1. The valve's designed ventilation must be determined by war time clean ventilation [volume] standards. The designed wind [air] velocity is generally at 8 m/sec.

3-3-2. Adopt the door-type structure for the valve's base seat. The air hole of the base seat (plate) should be rectangular. The side length is generally 5-15 cm. The distance between hole edges is 2-3 cm.

3-3-3. The base seat's (plate's) designed air hole area should be 5 percent greater than the needed ventilation area. The ventilation area around each suspended plate should not be greater than 0.1 m^2.

3-3-4. The width of the suspended plate is generally greater than the height and the [aperture] angle should not be greater than 15°. Generally no hole is made on the suspended plate. It is possible to take 15-20 mm on the pressure side of the suspended plate.

3-3-5. Place buffer gaskets between the suspended plate and base seat (plate) and between the base seat (plate) and valve's door frame. The gaskets are generally made of plywood. The thickness is 5-12 mm. The hardness should be 40-55 joules.

II. Wave-Dissipating System

3-3-6. The wave-dissipating system should be designed in accordance with the designed pressure of openings and the allowable residual pressure of equipment in the mechanical ventilation and power station's exhaust systems. The residual pressure following the dissipation of waves should not be greater than the residual pressure value.

3-3-7. According to the difference in resistance of forces, it is possible to select the forms of diffusion room, valve, valve-valve room, and valve-diffusion room.

CHAPTER IV. VENTILATION

Section 1. General Specifications

4-1-1. Planning of civil air defense construction ventilation should be carried out based on principles of economics, nationality, reliability, simplicity and ease of construction, depending on the required levels of protection and utilization.

4-1-2. Functions of ventilation design in civil air defense construction:

1. To insure a fresh air supply for people in the shelter for work and living.

2. To expel waste gas and to make sure that air quality meets health standards.

3. To eliminate excess heat and humidity and maintain fixed levels of temperature and humidity in the project.

4. To guarantee that the ventilation system has the required airtight protective capacity to prevent shock waves generated by a nuclear blast, chemical toxic agents, bacteria, and radioactive contaminants from entering the shelter.

4-1-3. The selection of ventilation equipment and materials should be based on reliability, durability, economy, ease of handling and ease of repair. The layout of the ventilation equipment, valves and pipes should be rational and compact, easy to operate and maintain. Length of buried pipes should be kept to a minimum.

4-1-4. Air temperature and relative humidity in the shelter should be determined generally according to the following criteria:

1. In summer, the room temperature and relative humidity in work and rest areas of command center personnel should not be higher than 30°C and 80 percent respectively; in winter, room temperature should not be lower than 10°C.

2. Indoor temperature should be between 20°C and 28°C and the relative humidity should not be higher than 75 percent during summer and winter in the surgical and emergency rooms of the hospital.

3. Naturally available heat and humidity of the shelter should be used in the personnel shelters (not work areas).

Section 2. Secure Ventilation

4-2-1. The ventilation design of civil air defense construction can be divided into three kinds according to the level of protection desired:

1. Fresh air type ventilation: the ventilation method used when the air outside the shelter has not been contaminated by radioactivity or chemical and biological agents.

2. Filter type ventilation: the ventilation method used when the air outside the project has been contaminated by radioactivity or chemical and biological warfare agents.

3. Isolation type ventilation: the ventilation method used when it is verified that contaminants have exceeded the capacity of the filtering absorbers after the air outside the shelter has been contaminated by radioactivity or chemical and biological warfare agents and the ventilation system's air intake and exhaust must be stopped. At the same time, ventilation by internal air circulation should be adopted.

4-2-2. Criteria for fresh air flow rate:

1. For personnel who keep working during hostilities, it takes 10~20 m^3/person/hour for the fresh air type of ventilation method and 2~5 m^3/person/hour for the filter type.

2. For personnel in shelters in wartime, it takes 3~7 cm^3/person/hour for the fresh air type of ventilation method and 1.5 ~ 2 m^3/person/hour for the filter type.

3. For long-term use of the shelter during peacetime, criteria similar to that for comparable structures above ground should be used according to requirements for different tasks.

4-2-3. For the isolated type ventilation, the allowed concentration (volumetric) of CO_2 inside the shelter should not be greater than 2 percent and 2.5 percent for working personnel and personnel in the shelter respectively.

4-2-4. Protective and ventilating devices like [shock] wave attenuators, dust eliminators, filter absorbers, and ventilators should be set up separately in the air intake system of the shelter according to the requirements of the different ventilation methods. Refer to Figure 4-1 for a diagram of the air intake set-up.

4-2-5. Protective and ventilating devices like shock wave attenuators, airtight valves, automatic exhaust valves, and exhaust fans should be set up separately in the shelter's ventilation system according to different situations in the shelter. Refer to Figure 4-2 for a diagram of the ventilation system.

4-2-6. If the filter type ventilation method is used, the air pressure inside the shelter should be greater than that outside by 3~5 mm of water column in order to prevent the toxic air from entering the shelter.

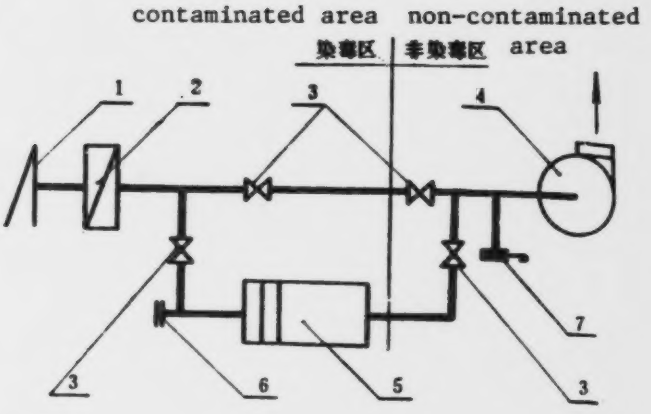

contaminated area
non-contaminated area
染毒区
非染毒区
1
2
3
4
7
3
6
5
3

Figure 4-1. Air intake system

1--shock wave attenuator; 2--coarse filter; 3--airtight valve; 4--ventilator; 5--filter absorber; 6--air exchange stopper for the filtering absorber; 7--air intake valve for the circulating air duct.

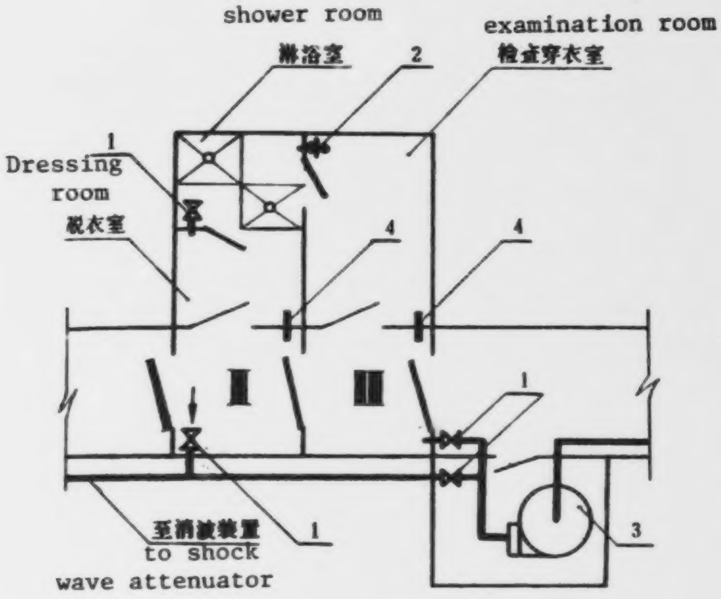

shower room
淋浴室
2
examination room
检查穿衣室
1
Dressing room
脱衣室
4
4
II
III
1
至消波装置
to shock wave attenuator
1
3

Figure 4-2. Planar arrangement of the air exhaust system

1--airtight valve; 2--automatic air exhaust valve; 3--ventilator; 4--short ventilating pipe

4-2-7. The number of automatic air exhaust valves in the exhaust system should be determined by the ventilation rate of filter type ventilation. The automatic air exhaust valves should be installed on airtight walls, but not on airtight doors.

4-2-8. Pressure gauges should be installed inside the shelter to measure the air pressure differential within and without the shelter in the filter type ventilation and should be conveniently located in the air exhaust machinery room.

Section 3. Natural Ventilation

4-3-1. In peacetime, natural ventilation should be used for civil air defense construction, whenever feasible.

4-3-2. Depending on the project utilization requirements, maximum use of favorable terrain, surface conditions and weather conditions should be made and the adopting of the necessary supplementary measures--thermal and wind potential--should be done to provide the motive power in the shelter for natural ventilation.

4-3-3. If natural ventilation is used in the shelter, a simple planar arrangement should be used to reduce resistance, to avoid blind angles, and to induce air circulation. Rooms that open onto other rooms and terminal rooms that extend too deep should be avoided. Ventilation louvres should be set up in walls and over doors in order to facilitate air convection.

4-3-4. The installation of natural air ventilation ports should be based on the planar arrangement of the shelter, area of the structure, and flow system of the air current. Each shelter (defense unit) should have at least one air inlet and one exhaust outlet. The exhaust outlet must be higher than the air inlet. To insure that the direction of air current inside the shelter does not change seasonally, the placement of the air inlet should always be at the point of positive potential with respect to the dominant air current, and the placement of the air exhaust outlet should be situated at the point of negative potential relative to the dominant air current.

4-3-5. The natural air ventilation ports should be compatible with the airtight protective requirements of the shelter.

Section 4. Mechanical Ventilation

4-4-1. Mechanical ventilation should be used in shelters that use the filter type of ventilation. If natural ventilation alone cannot meet the ventilation requirements of the shelter, the shelter should be supplemented by mechanical ventilation.

4-4-2. Computations of ventilation flow rates in the shelter should be made separately according to whether the ventilation flow rate is of the wartime fresh air type or filter type, or long-term peacetime ventilation.

4-4-3. The larger value of the following two air flow values should be used as the flow rate of wartime fresh air type ventilation.

1. The ventilation rate is computed in accordance with 4-2-2.

2. The ventilation rate is computed by taking into consideration that ventilation is needed to expel excess heat, humidity and toxic substances.

4-4-4. The larger value of the following two air flow values should be used as the flow rate of filter type ventilation.

1. The ventilation rate is computed in accordance with 4-2-2.

2. The ventilation rate is computed on the basis of the air leak rate calculated from the air replenishment rate as stipulated for anti-gas passageways and the air leak rate when the shelter is operating with excess.

4-4-5. The hourly air leak rate of a shelter made of poured concrete can be computed as 4 percent of the total volume of the shelter's sealed area when the excess pressure is 5 mm of water column; for a shelter covered by other materials, it is determined by experimental measured data in similar shelters.

4-4-6. In order to maintain a fixed level of normal pressure, the total exhaust rate of the exhaust system of the shelter should be less than the total air intake rate of the intake system.

4-4-7. The ventilation frequency for different kinds of exhaust chambers for fresh air or peacetime ventilation can be computed as in Table 4-1.

Table 4-1. Frequency of air exchange in different kinds of air exhaust rooms

Kind of room	Frequency of air exchange (times/hr)
Toilet	10 ~ 15
Reservoir area between water pumps, cesspool area between waste water pumps	1 ~ 2
Washing area, bath	3 ~ 5
Oil storage room of diesel power generating station	5 ~ 6

4-4-8. The quantity of air intake and air exhaust should be determined according to the scale and usage of the shelter. For back-up inlets and outlets, measures should be taken to prevent blockages.

4-4-9. Air (smoke) intake and exhaust outlet equipment should meet the following requirements:

1. Air intake outlets should be located in an unblocked, clean area. The lower edge of the port should be 0.5 higher than ground level in order to prevent dust being sucked into the shelter. If the outlets of the air ducts and vertical ventilation shafts are exposed aboveground, measures should be taken to avoid outlets from being filled with water.

2. The ports for air intake and air (smoke) exhaust should not be located together. Air intake ports should be located on the windward side of the annual prevalent wind direction and should be lower than the air (smoke) exhaust ports.

3. To insure that the ventilation requirements for the cleaning area and anti-gas passageways is met, an air exhaust port should be located at the entrance/exit of the cleaning area for those shelters equipped with cleaning facilities.

4-4-10. The air circulation system of one chamber should meet the ventilation requirements of all the chambers. Forced draft blower from the upper part and exhaust from the lower part are generally adopted for the chambers. For machine equipment rooms where large amounts of residual heat must be expelled, forced draft blowing in the lower part and exhaust in the upper part should be used.

4-4-11. Rooms that produce large amounts of toxic substances (such as toilets, battery storage rooms) should be relatively close together and situated close to the intake section of the exhaust duct. Negative pressure should be maintained inside these rooms.

4-4-12. The choice of ventilators should meet the following requirements:

1. Manual ventilators may be selected if there is no internal power source in the shelter. Manual and electrical dual-purpose ventilators may be selected where there is an internal power source that cannot guarantee a continuous power supply. Electric ventilators may be selected if a continuous power supply can be guaranteed by the internal power source.

2. To compute pressure loss in the ventilator, a factor of 10~15 percent should be added; to compute the air flow rate in the ventilator, a factor based on the air leak rate of the ventilator should be added. For air ducts made of brick or concrete, a factor of 10 ~ 15 percent should be added. For metal air ducts, a factor of 0 ~ 10 percent should be added.

3. When the air flow rates in the ventilation systems of the fresh air type, filter type, and long-term peacetime type differ greatly and their difference exceeds the characteristic curve for a ventilator (or performance chart), ventilators should be selected case by case. [Note: The air leak rate of the air ventilation duct may be omitted from the computations for air ventilation ducts]

4-4-13. The materials used in the air ventilation duct should meet the requirements of being moisture-proof, corrosion-proof, and economical. Brick air ducts, concrete air ducts, and sheet metal and plastic air ducts should be set up according to local conditions and availability of materials. When plastic air ducts are used, applicable fire-prevention regulations should be followed.

4-4-14. Fullest use should be made of the shelter's structural spaces when arranging ventilation ducts. Suspended and partitioned air ducts can be used. Overhead construction is recommended when sheet metal air ducts or plastic air ducts are used. When a floor air dict is used, the elevation of the bottom of the air duct cannot be lower than that of nearby water drainage ditches and measures to prevent water drainage should be used.

4-4-15. Pipeless forced draft blowing should be used if the heat and humidity requirements of the shelter are not high where the architectural planar arrangement is relatively simple.

Section 5. Air Treatment

(I) Computational Parameters for Air Outside of the Shelter

4-5-1. For summer ventilation, the average value of the medium monthly temperature of the hottest month over the years should be taken in computing the dry bulb temperature of the air outside of the shelter. An annual average not assuring 400 hours moisture content value for the average year should be taken in computing the moisture content of air outside the shelter. [Note: 'Over the years' here means over the most recent 10 years recorded by local meteorological stations. If the station has records of less than ten years duration, statistical results should be determined after data has been analysed and compared with nearby stations]

4-5-2. For winter ventilation the average values of the medium monthly temperature and relative humidity of the coldest month over the years should be taken respectively in computing the dry bulb temperature and relative humidity of air outside the shelter.

4-5-3. The average value of the coldest three months of winter over the years should be taken to compute the atmospheric pressure, average wind velocity, prevailing winds and their frequency outside the shelter; in winter (summer), the average value of the coldest (hottest) three months over the years should be used in the above computations.

(II) Computation of Heat and Humidity Loads

4-5-4. The heat and humidity loads inside the shelter include:

1. The rate of heat and moisture dissipation from human sources.

2. The rate of heat and moisture dissipation from machine installations and pipes.

3. The rate of heat dissipation from lighting.

4. The rate of heat conduction and moisture dissipation in the surface of the surrounding protective structures.

5. The rate of moisture dissipation brought about through food and drink and washing.

4-5-5. The rate of heat and moisture dissipation of human bodies, equipment and ducts and heat dissipation due to illumination can be determined by ventilation designs used in industrial and civil engineering.

4-5-6. When the depth [of the structure] is greater than 10 m, the heat of the conducting of the surrounding protective structure Q can be calculated according to (5-1).

$$Q = KF\,(t_n - t_o) \qquad \text{(Kcal/hr)} \qquad (5\text{-}1)$$

in which

t_n-----air temperature (°C) inside the shelter (or Chamber)

t_o-----internal temperature °C) of the ground

F------inner surface area (m^2) of the shelter (or chamber)

K------coefficient of heat conduction

$$K=\frac{1}{\frac{1}{\alpha_n}+\frac{1.13\sqrt{aZ}}{\beta\lambda}} \qquad (Kcal/m^2/hr/°c)$$

α_n-----the heat exchange coefficient of the surface of the surrounding protective structure, is usually taken as 4~5 (Kcal/m^2/hr/°C)

a------thermal conductivity coefficient of the ground (m^2/hr)

λ------thermal conductivity coefficient of the ground (Kcal/m/hr/°C)

Z------heating time during the pre-heating period (hr)

β------correction coefficient of the shape of the shelter (or chamber)

for a square shelter or chamber (spherical equivalent)

$$\beta=1+\sqrt{F_0}$$

for a rectangular shelter or chamber (cylindrical equivalent)

$$\beta=1+0.38\sqrt{F_0}$$

F_o-----Fourier coefficient

$$F_0=\frac{aZ}{R_0^2}$$

R_o-----equivalent radius of the chamber's cross section when the ratio of length over width is larger than 2:

$$R_0=\sqrt{\frac{S}{\pi}} \qquad \text{(cylindrical equivalent)}$$

when the ratio of length over width is less than 2:

$$R_0=0.62\sqrt[3]{V} \qquad \text{(cylindrical equivalent)}$$

S------the area cross section of the shelter or chamber (m^2)

V------the volume of the shelter or chamber (m^3)

4-5-7. The heat of conduction of the surrounding protective structure can be calculated from the relevant sources if the shelter is buried in a depth less than 10 m.

4-5-8. The ground initial temperature t_o ought to be computed by using experimental data from the same type of shelter or from similar shelter. When no experimental data is available, the following method can be used to calculate t_o:

1. t_o can be calculated according to equation (5-2) for a shelter buried at a depth of less than 10 m.

$$t_0 = t_{dp} \pm A_0 e^{-\sqrt{\frac{\omega}{2a}} \cdot x} (℃) \tag{5-2}$$

in which

t_{dp}----the annual average temperature (°C) of the local ground surface over the years.

A_o-----the annual wave amplitude of the local ground surface temperature over the years.

In summer $A_o = t_{dr} - t_{dp}$

In winter $A_o = t_{dp} - t_{de}$;

t_{dr}----monthly average temperature (°C) of the hottest month of the local ground surface over the years.

t_{de}----monthly average temperature (°C) of the coldest month of the local ground surface over the years.

e------base of natural logarithm, e = 2.72.

ω------frequency of the annual temperature fluctuation (radian/hr)

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{8760} = 0.000717;$$

α------thermal conductivity coefficient of the ground (m/hr);

x------the calculated depth (m) from the ground level to the desired underground level which is at the initial temperature.

$\pm$------'+' is for summer calculation
'_' is for winter calculation

2. The annual average local ground surface temperature over the years can be used for shelters buried at a depth greater than or equal to 10 m. i.e.,

$$t_o = t_{dp} (°C)$$

3. Equation (5-3) can be used as a correction factor if there is a big difference between the sea level elevations of the shelter site and the meteorological station.

$$t_0' = t_0 - \frac{H_h - H_q}{M} (℃) \tag{5-3}$$

in which

t_o'-----the initial temperature (°C) of the ground after correction from the sea level altitude.

H_h-----Sea level elevation (m) of the shelter's entrance/exit

H_g-----Sea level elevation (m) of the neighboring meteorological station

M------the air temperature drop coefficient due to difference in altitude, usually M = 200 m/°C

4-5-9. Empirically measured data should be used to calculate the moisture dissipation rate of the covering surface of the shelter. If no empirical data is available, 1 ~ 2 gm/m^2/hr can be taken for concrete wall-adhering covering, 0.5 gm/m^2/hr can be taken for linings and coverings detached from the wall.

4-5-10. The moisture dissipation rate generated by personnel working and living in the shelter (such as food and washing) can be calculated on the basis of 30 40 gm/person/hr.

(III) Heating and Moisture Reduction

4-5-11. For shelters requiring heat, industrial waste heat, city heating networks, or ground level boiler rooms near the shelter should be fully exploited as heat sources. For heat ducts leading into the project, protective airtight devices such as valves should be installed on the lead-in ducts inside the shelter.

4-5-12. Combined measures in the moisture reduction design of the shelter from the standpoints of designs in the architectural structure, flood control, and waste water disposal should be aimed at strictly controlling the moisture sources in order to reduce the moisture dissipation rate in the shelter.

4-5-13. Air ventilation moisture reduction measures should be used when the moisture content of the air is low. Air ventilation moisture reduction by temperature elevation should be used when there are regions of available heat sources near the shelter.

4-5-14. Solid hygroscopic agents or localized moisture reduction by dehumidifier should be used in rooms where there is a high priority for moisture removal.

Section 6. Ventilation of Diesel Power Generating Stations

4-6-1. The design of ventilation in diesel power generating stations should not only expel the residual heat and fumes in the engine rooms, but also satisfy the requirement for providing sufficient air for combustion needed in the diesel engine.

4-6-2. Independent air intake and exhaust systems should be installed in the engine room of the power station. If air from the main part of the shelter is used to ventilate the engine room, toxic substances from places such as the battery storage room and toilets should not be discharged into the engine room.

4-6-3. When fresh air type ventilation is used, the air intake and air exhaust rate should fulfill the following requirements:

1. If air cooling is adopted in the engine room (air outside of the shelter is used for ventilation and temperature lowering), computations should be based on the ventilation rate required to eliminate the residual heat.

2. If water cooling is used in the engine room (water is used as a cooling agent to cool the air inside the engine room), computation should be based on the ventilation rate required to expel the toxic substance.

3. The air exhaust rate in the engine room should be equal to the air intake rate minus the air consumption rate of diesel combustion.

4-6-4. The air consumption rate of diesel combustion can be calculated on the basis of 5 m^3/horse-power/hr. In the fresh air type ventilation the air inside the engine room should be used for combustion. In the isolated type of ventilation, air outside of the shelter should be used directly for diesel combustion, and the resistance for the automatic tapping system should not be more than 100 mm in water column in order to reduce the level of fumes in the engine room.

4-6-5. Open-type circulation should be used in the water cooling system of the diesel cylinder. The heat dissipation rate of the diesel engine, generator, and smoke exhaust pipes should be computed to arrive at the residual heat of the engine room. If closed type of circulation is used, the heat generated by the cooling water from the diesel engine cylinder into the engine room should also be computed.

[Note (1) open-type circulation is a system in which the cooling water, directly expelled after cooling the cylinder, may be partially drained into a mixed water reservoir.

Note 2 closed-type circulation is a system in which the cooling water, after passing through the heat dissipator, flows back to the cylinder in repeated cooling circulation]

4-6-6. Shower facilities, surface type cooler, or heat dissipation water tank that comes with the diesel engine can be used to lower engine room temperature if the shelter's water flow rate and temperature can meet engine room temperature drop requirements. If the heat dissipation water tank that comes with the diesel engine is used to lower the temperature of the engine, the cooling system of the diesel engine cylinder should be changed from a closed-type to an open-type circulation in order to channel the cooling water into the heat dissipation water tank for cooling of air circulation in the engine room.

4-6-7. A combination of air cooling and water cooling should be used in engine rooms if there is insufficient water in the shelter or the water temperature is too high. If the air outside of the engine room is contaminated, measures to lower the temperature by water cooling should be fully exploited.

4-6-8. The amount of fresh air in the control room of the diesel power generating station connected to the shelter should be supplied by the shelter's ventilation system. If supply must come from the engine room of the power station, airtight valves and noise attenuators should be installed on air ducts leading into the control room.

4-6-9. Ventilation and air exchange facilities should be set up in auxiliary rooms located between oil storage areas, water reservoirs and water pumps of the power stations. For frequency of air exhaust and air exchange rate, see Table 4-1. Air exhaust pipes ought to lead into the air exhaust system of the power station. But fireproof valves should be installed on air exhaust pipes that lead into oil storage areas.

Section 7. Ventilation for Other Types of Shelters

(I) Air Ventilation in Transformer Rooms

4-7-1. The ventilation in the transformer room should be designed to expel the residual heat inside the room. Room temperature should not be higher than 35°C.

4-7-2. The residual heat of the transformer room should be equal to the sum of heat dissipation in the empty load loss and short circuit loss.

4-7-3. Ventilation and adjustable valves should not be installed in the transformer room. The distance between the air duct inside the room and high voltage bus bars should not be less than 0.5m. Fireproof valves should be installed on the intake and exhaust ducts of the transformer room.

(II) Ventilation for Small Storage Facilities

4-7-4. The temperature and relative humidity of the air inside storage facilities requiring temperature and humidity regulation should be calculated according to Table 4-2.

Table 4-2. Air temperature and relative humidity inside the warehouse

Kind of warehouse	Temperature (°C)	Relative Humidity (%)
Food	less than 25	less than 75
Ammunition and medicine	lower than 30	less than 70
Others	lower than 30	less than 75

4-7-5. Storage facility ventilation is generally a combination of closed-type and natural type. Mechanical ventilation may also be used as needed.

4-7-6. Designs for reducing moisture inside the storage facility can be based on 4-5-12 to 4-5-14.

(III) Ventilation for Passageways

4-7-7. Generally, ventilation is used for personnel evacuation passageways. Air intake and air exhaust ports for natural ventilation should be installed depending on the actual situation.

4-7-8. Ventilation for passageways used by motor vehicles should be designed with the purpose of expelling toxic gases. At wartime the allowable level [volumetric] of carbon monoxide should not be higher than 0.2 percent.

4-7-9. Natural ventilation should be used for these passageways. When that cannot fulfill requirements, mechanical ventilation may be used. The magnitude of the ventilation rate should be determined by factors such as the number of vehicles, their speed, loads, and the kind of fuel used.

CHAPTER V. WATER SUPPLY AND DRAINAGE

Section 1. Water Supply

5-1-1. Depending on factors such as particular usages in the shelter, the degree of desired hygiene and local weather conditions, the daily water consumption rate standard should be based on Table 5-1.

Table 5-1. Standards for Daily Water Consumption Rate

Items of Water Consumption	Unit	Water Consumption Rate
Drinking water	liter/person/day	3-5
Rinsing and washing water	liter/person/day	5-10
Flush toilet water	liter/person/day	24
Water consumption for patients		
In-patient	liter/bed/day	60-80
Out-patient	liter/person/day	6-8
Cooking water	liter/person/day	4-6

Note: The water consumption rate for drinking, washing, and flushing toilet is included in the water consumption rate for the in-patients. The water consumption rate for working personnel in the hospital and first-air stations should be computed as that of the shelter personnel.

5-1-2. The quality of daily drinking water should meet national requirements in "Hygiene Standards for Daily Drinking Water."

5-1-3. Water quality, temperature and pressure and the rate of water consumption in the facilities should be determined by the shelter's requirements.

5-1-4. There are four kinds of water sources in the shelter:

1. Independent internal water source. This is the water source inside the shelter intended for an independent shelter or a protective unit of a joint shelter.

2. Regional internal water source. This is the water source inside the project intended for the shelters within the scope of the project.

3. External underground water source. This is the underground water source set up adjacent to the shelter, generally intended as a reserve water source and is well-protected.

4. Lead-in water source. This is the city tap water drawn into the project and is mainly intended as a reserve for the shelter's daily supply.

5-1-5. The following requirements should be met for water source facilities of the project.

1. A technique vs. cost comparison should be employed according to the water sources situation and utilization requirements.

2. For the same shelter, more than one water source should be available to insure a sufficient water supply.

3. Internal water sources, especially independent ones, should be fully exploited.

4. Reservoirs or water tanks should be used in shelters where internal water sources cannot be provided or are inadequate for a supply of water. The water storage rate should be determined by the number of personnel during wartime and the duration of their stay.

5. The internal water sources and water storage facilities should be located in a clean area within the shelter.

6. Joints in pipelines between an independent water source and other water sources should be protected from contamination.

5-1-6. Potable water reserve cisterns or tanks should be set up separately. If they are set up together with non-drinking facilities, measures should be taken to ensure that the drinking water is not used for other purposes.

5-1-7. The selection of a water supply system should meet the requirements of water quality, temperature, pressure, and flow rate in the various water supply functions of the shelter in accordance with the overall water supply situation. With a rational technology-to-cost ratio, a circulating water supply system should be set up, and excess water pressure should be exploited as much as possible.

5-1-8. Gravity flow from reservoirs or tanks placed at a higher level should be used wherever possible to supply water for daily needs inside the shelter.

5-1-9. Water supply pipes inside the shelter should be exposed.

5-1-10. Anti-earthquake and flooding measures must be taken at those points where the pipes pass through the outer walls of the shelter; they must be made airtight at the point where they pass through the wall.

5-1-11. Lead-in water supply pipes should be made of steel. Corresponding durable control valves should be placed inside the lead-in ports of the shelter.

Section 2. Water Drainage

5-2-1. Generally, waste water is drained by gravity or by waste water pumps.

5-2-2. In order to prevent a build-up of negative pressure, generally water will not be drained out during the period the shelter is sealed off. But water may be drained out if the drainage rate is smaller than the water supply rate and also a continuous water supply is maintained.

5-2-3. When the shelter is sealed off, all items of water consumption must be controlled and water drainage rates reduced. Waste water collected from the cooling of internal facilities should be directed to flow back to the original reservoir. If heat generated from the facilities is substantial and calculations show that a single level reservoir cannot meet the water consumption requirements, double or multi-level reservoirs can be adopted. The lowest tier of a multi-level reservoir should not be filled with water and its volume should not be included as part of the effective [total] volume of the reservoirs.

5-2-4. The volume of the cesspool should meet the following requirements:

1. The volume of the cesspool drained by the waste water pumps should include the readjusted and reserve volumes. The readjusted volume should be determined by the in-flow waste water rate and the operation of the water pumps; the reserve volume should be calculated on the basis of the total waste water in-flow rate during the period of shelter isolation.

2. The reserve volume of a cesspool with induced drainage cannot be less than the overall volume of waste water inflow during the period the shelter is sealed off and served by filter type airconditioning multiplied by a safety coefficient of 1.25.

3. The reserve volume of a cesspool with a gravity drainage system should be computed on the basis of the in-flowing total volume of waste water for the period during which the shelter is sealed off.

4. Generally, the reserve volume of the cesspool should not be utilized for other purposes.

Note: If drainage conditions stipulated in 5-2-2- are met, the reserve volume of the cesspool does not include the volume occupied by the out-flow during the period of isolation.

5-2-5. Cesspools should be located in a clean area of the shelter, generally at the lower reaches of the drainage pipe near the entrance of the shelter. If toilets and washrooms are set up together, they can be installed under these areas.

5-2-6. Floor drains should be installed in the toilets, washrooms and other water consumption areas with a slope of not less than 1 percent toward the floor drain and with their upper comb-like surfaces 5 ~ 10 mm lower than the surrounding ground level.

5-2-7. If there is a possibility of back-up, flow-control valves and gates should be installed in the drainage outlets.

5-2-8. Measures to counter poison gas and blast should be provided in the drainage pipes of the shelter in order to prevent poison gas and atmospheric shock waves from entering the shelter through the drainage pipes.

Section 3. Cleaning and Disinfection

5-3-1. Water consumption rate should be followed as in Table 5-2.

Table 5-2. Water Consumption Rate for Cleaning and Disinfection

Items of cleaning and disinfection	Unit (each time)	Water consumption rate in cleaning and disinfection
cleaning and disinfection of personnel		
shower	liter/person	30-40
washing	liter/person	5-10
Floor cleaning and disinfection	liter/m^2	5-10

Note: Higher values should be used for shower water consumption rate in washing and disinfection for personnel of hospitals and first-air stations.

5-3-2. Generally, the temperature for personnel hot water shows is around 37-40°C. Heating facilities should guarantee that all showers be ready for use within 30 minutes after heating.

5-3-3. Cooling water for diesel engines or other facilities is used as a source of hot water for cleaning and disinfection. Measures should be taken to prevent the cooling water from becoming contaminated.

5-3-4. A water supply system consisting of single pipes should be used in the shower set-up. A combined water tank or a cold and hot water mixer should be set up in the screening room.

5-3-5. Water sprinklers or fire hydrants equipped with rubber hoses for disinfection should be installed in chambers and passages of the shelter's main entry and exit parts which may suffer contamination from waste water. The service radius of the sprinkler or fire hydrant generally should not exceed 25 m and the outlet water water pressure should not be less than 10 m of water column.

5-3-6. Floor drains or drainage outlets with a diameter of not less than 75 mm should be installed in chambers and passageways that require disinfection. Generally, protective measures should be taken at drainage outlets.

5-3-7. Waste water from cleaning and disinfection should be drained separately.

Section 4. Firefighting

5-4-1. Those shelters in which there is a danger of conflagration should be provided with a supply of water for firefighting or light firefighting gear, fire alarm systems and emergency telephones based on the probability of fire breaking out and the extent of the danger.

5-4-2. Shelters provided with a water supply for firefighting should [also be] equipped with facilities to drain off the excess firefighting waste water.

Section 5. Cooling Water and Oil Supply for Diesel Generating Stations

5-5-1. Cooling methods such as water cooling (direct flow method), air cooling (circulating method) or air water cooling (direct flow and circulating method) should be used in the water-cooling system of diesel generators according to the types of water sources, meteorological and air-conditioning conditions.

If the water cooling system is adopted, a repeated utilization method should be employed for the water consumption for air-conditioning in the generator room and the water consumption for cooling the diesel engine. Self-circulated utilization should be considered in the water consumption for air-conditioning.

If the air cooling system is adopted, the water refilling rate for a standing type of air-cooler generally should be computed on a rate of 2 liter/horsepower/hour.

5-5-2. The water supply for diesel generators can originate from inside the project, from external water source and reservoir of the power station. Generally, the water supply comes from the reserve reservoir of the power station during the period the shelter is sealed off. The volume of the reservoir is computed according to Table 5-3.

Table 5-3. Water Storage Time

Conditions of water sources	unit	water storage time
without self-provided internal water source	hour	2-4
without self-provided external water source	hour	8-10
using urban tap-water source	day	3-5

5-5-3. The temperature regulation of cooling water in diesel engines can be either a combined pipeline or a combined water reservoir regulation. If combined pipeline regulation is adopted, maximum utilization should be made of the thermostat on the diesel engine. If combined water pool regulation is adopted, the volume of the combined water reservoir should be computed according to the cooling water rate of the operating diesel engine within 5 ~ 15 minutes at a set operating power.

5-5-4. Measures to assure an ample supply of water in the cooling system before starting up the diesel engine.

5-5-5. Water-temperature thermo-meters should be installed on the lead-in and lead-out pipes of the diesel engines. Water level gauges and pressure meters should be installed on drainage pipes. Bleeder valves should be installed on pipes at local high points.

5-5-6. Diesel generators should have at least a 7 to 15-day fuel oil supply for operation.

5-5-7. Fuel oil should be stored in two or more oil tanks, oil drums or oil reservoirs.

Oil lead-in, oil lead-out, oil drainage pipes, air ventilation pipes and an oil level meter should be provided for oil tanks, drums and reservoirs. Oil tanks should be fitted with cover plates, which are in turn fitted with maintenance hatches. Hatches should be provided for oil tanks and reservoirs.

Oil lead-out pipes should be placed 0.15~0.20 m above the bottom level of the oil tanks, drums and reservoirs.

5-5-8. Depending on the actual situation, the oil delivery connection well can be located below the upper part of the oil storage space or outside the protective airtight door. A gate with the proper strength should be installed near the oil-delivery lead-in pipe inside the shelter.

5-5-9. Measures to prevent seepage and leakage should be adopted for the oil tanks, drums and reservoirs.

CHAPTER VI. ELECTRIC POWER AND LIGHTING

Section 1. General Specifications

6-1-1. This chapter is applicable to designs of a power supply of less than 10 KV for lighting in tunnels and excavated shelters.

6-1-2. The design of electric power supply for lighting of the shelter has to be safe, reliable, economical, and convenient to install and maintain.

6-1-3. In the electric equipment of the project, moisture- and mildewproof products should be used and efficient procedures should be devised to guard against dampness and rotting. Routine maintenance schedules should be emphasized.

Section 2. Power Supply

6-2-1. The power sources of the projects include:

1. External power sources

2. Independent internal power sources

3. Regional internal power sources

6-2-2. An overall integrated installation plan is needed for the power sources in the shelter.

1. All sites should be properly connected to external electric power sources.

2. Internal independent power sources should be installed in major shelters.

3. For other shelters, maximum use should be made of regional internal power sources or a switch made to these units' underground power supply facilities during hostilities.

6-2-3. The total transformer capacity of the external power sources should be determined by the total calculated loads for all the power-consuming equipment in the projects.

6-2-4. The number and the output capacity of the diesel generating units in the internal power supply should be determined by the following requirements:

1. The total capacity of the units in operation should be determined by the total calculated loads of all the power-consuming equipment in the projects together with the continuous power rating for each generating unit after allowed corrections are made in an actual operation condition.

2. In determining the capacity of a generating unit, the capacity of the squirrel-cage starter motor should be taken into consideration. Table 6-2 should be used in determining the percentage value of the full-voltage starter cage motor capacity of the generating unit.

3. In designing an independent internal power source for the project, at least two generating units should be used in the power station. Thus when one unit encounters problems, the other set can supply power for all the important loads.

A single generating unit may be installed in the power station, when a neighboring internal power source is connected and used as an auxiliary power source for the important loads.

6-2-5. Operation modes for the power source

1. Internal and external power sources should be operated in different series. Usually the external power source is the main power supply source.

2. Operation in parallel is preferred if two units or more of the diesel generators of the same capacities and the same model are operated at the same time. When the load distribution is even, operation in different series can be adopted.

3. Reliable measures should be adopted to prevent the error of operation in parallel among the different power sources intended for operation in different series.

6-2-6. The generally used wiring mode for low-voltage bus-bars is a single bus-bar or sectional single bus-bar. If a sectional bus-bar is used, sectional bus-bar switches should be installed.

6-2-7. Means of guaranteeing the cut-off and switching of the important power supply loads and cutting down the secondary loads should be provided.

6-2-8. It is inadvisable to use the same return circuit for both the communication load and the operation load.

6-2-9. Single-phase power-using equipment should be distributed as evenly as possible over a three-phase circuit.

Section 3. Electrical Circuits

6-3-1. The following requirements should be met in choosing the cross-sections for the insulated electric wires and cables:

1. The allowed current-carrying capacity should not be less than the calculated power load of the circuit.

2. The requirement for mechanical strength should be met in the smallest cross section of the wire. Aluminum wire should not be less than 2.5 mm^2; copper wire, except for the head lamp wire which is not less than 0.5 mm^2, should not be less than 1.0 mm^2.

3. The allowable values for circuit voltage loss from the low voltage side output from the transformer or the low voltage bus-bar from the generator to the terminals of the power-using equipment should not be greater than those specified in Table 6-1.

Table 6-1. Values of allowed circuit voltage loss

Kinds of power-consuming equipment	Allowable loss in voltage (%)	
	Normal circumstances	Special circumstances
Electric motor	5	10
Lighting	5	10
Thermoelectricity (illumination below 36 V)	10	
Ordinary communication facilities	5	

4. The choise of cross-section for the insulated wires and cables should be compatible with the protective devices.

6-3-2. Aluminum conductors can generally be used in the electrical circuits but under the following conditions, copper conductors should be used:

1. Secondary connection wires and control cables in the control panel.

2. Wires and cables in mobile equipment.

3. Rooms in a flammable, explosion-prone and corrosive environment.

6-3-3. For power cables and lead wires, all-plastic cables, plastic insulated wires should be used, as far as possible.

6-3-4. The external power supply for the project should employ buried, lead-in cables, as far as possible.

6-3-5. In the installation of power cables and lead wires, the following requirements should be met:

1. Cables are usually laid in the open along the roof of the project, side walls or supporting frames of the air-ducts.

2. Insulated wires are usually laid in the open by using Plastic cleats, procelain cleats, or procelain knobs. But raceway wiring (or plastic-sheathed wires) should be used in rooms with a flammable, explosion-prone or corrosive environment or in situation when the operating voltage of the wires is above 220V, and also when laying wire horizontally or vertically along side walls, at a height of less than 1.8 meter, and when laying wire horizontally along the ceiling at height lower than 2.0 meters.

6-3-6. The connections to insulated lead wires usually are pressure joints or soldered joints. At the joints anti-corrosion and tight sealing measures should be used.

6-3-7. Proper sealing procedures should be used when electric raceways and wiring must pass through a protective door, a hermetically-sealed protective door, a hermetically-sealed door's partition wall or door frame. Additional raceway outlets should also be provided with hermetic seals. Zinc-plated steel tubing should be used.

Section 4. Electric Power and Illumination

6-4-1. Usually a magnetic starter is selected as the starting control device for the cage-type motor. An iron-clad switch can also be chosen when the motor capacitance is less than 4.5 KW and it has enough power to be controlled by starter.

6-4-2. When the cage-type motor is started at full voltage, its terminal voltage has to fulfill the following requirements:

1. A reserve motor usually cannot have a voltage lower than 85 percent of the specified value; a frequently operated motor cannot have a voltage lower than 90 percent of the specified value.

2. The allowable value of the motors can be less than 85 percent if the motors can be guaranteed to sustain the starting torque exerted by the mechanical equipment and also if the waves induced in the system are not powerful enough to damage the other electrical parts under normal working conditions.

The capacitance of the full voltage starter cage motor as a percentage of that of the generator and transformer can be determined by Table 6-2.

Table 6-2. The capacitance of the full-voltage cage-type starter motor as a percentage of that of the generator and transformer

Kind of power source	Excitation voltage control method	Capacity of the full-voltage cage-type starter motor (%)
Diesel generating unit	normal voltage control	10
	carbon resistor type automatic voltage regular	12 ~ 15
	Silicon controlled rectifier voltage regulator with exciter [auxiliary generator]	15 ~ 25
	Silicon controlled mutually and self-excited constant voltage installation	15 ~ 30
	Tertiary harmonic wave excitation	50
Transformer		Reserve starter 30
		Regular starter 20

6-4-3. Motors should be equipped with the following protective set-up:

1. Depending on specific circumstances, overload protection is used. Short circuit protection must be used.

2. Two-phase operation protection should be used to protect the continuously operated three-phase AC motors. But it may be skipped if the following conditions exist.

a) The stator is one with star-shaped wiring which is also equipped with an overload protection.

b) There is always a guard on duty, and the facility is equipped with two-phase operation instructions.

The two-phase operation protection set-up should be equipped with a three-phase thermo-electric relay with a differential conducting panel. When limited by conditions, other special protective devices can be substituted.

3. Voltage loss protection should be employed when the operating machinery does not allow for self-starting or the capacitance of the power sources cannot satisfy the requirements for self-starting.

6-4-4. It is recommended that an automatic water level control be installed in the motor of the sewage pump and the water drainage pump. Readily accessible push-button on/off switches should be installed in all remote-controlled and automatic motors.

6-4-5. The switch-box for illumination and power should be installed inside the hermetically-sealed door (except for the generator rooms of power stations), near the center of the electricity load, where it is easy to maintain, and placed in a relatively dry place.

6-4-6. Incandescent and flourescent lamps are the usual sources of illumiation. In situations where brighter lighting is needed, other kinds of light sources can be used.

6-4-7. 220 V AC is adopted as the voltage of electric sources for illumination. The voltage should not be higher than 36V if the lowest point of the lamp's position is 2.0 meter below ground level and no other safety measures are available.

6-4-8. Fuse protection of 15A or smaller is usually used for each single phase return circuit in the illumination loads of the projects. Independent fuse protection should be used inside the hermetically-sealed door for the illumination return circuit from inside the project to outside the hermetically-sealed door.

6-4-9. A criss-cross power supply with two-phase or three-phase return circuits is generally used for the lighting in the main passages designed for emergency evacuation. Separate power supplies should be used for passage illumination and room illumination.

The illumination loads of the projects should be controlled region by region and section by section.

6-4-10. Except for the surgery room in a hospital, a special emergency-use illumination power supply is not generally installed.

6-4-11. The minimum illumination standards for important offices and passages in the project should meet the specifications of Table 6-3.

Table 6-3. Illumination Standards

Name	Lowest illumination (lux)	Name	Lowest illumination (lux)
Command office	100	control room	75
chief's office	75	diesel engine room	50
staff's office	50	shelter room	10
surgery room	75	disinfection room	10
medical clinic	50	exit	50
communications office	50	passageway	5

Note: The above figures do not include localized illumination.

Section 5. Electric Power Stations

6-5-1. Diesel generator units with automatic voltage regulation and electric or air starters are generally chosen for electric power stations. Air-compressors should be installed in a power station using air-started units, with a compressed air cylinder for each unit. Pipelines for the starter and for adding air should be interchangeable; seamless steel tubes should be used; and air releasing valves should be placed at the terminals of the pipelines.

6-5-2. The arrangement of the generator room should fulfill the following requirements:

1. The arrangement of the generator room should satisfy the requirements for safety of operation and maintenance of the equipment and convenience of moving. Compactness and neatness should be emphasized. Criss-cross pipelines should be avoided and cables should be kept dry.

2. The two configurations in general use for generator rooms are with the axis of the generator units parallel to the axis of the room (Figure 6-1) and with the axes perpendicular (Figure 6-2). The dimensions of the generator room should be less than the values stipulated in Table 6.4.

3. In addition to placing the generator units according to the dimensions in Table 6-4, the placement of auxiliary equipment, equipment for simple repairs of machines, tool boxes, spare parts, storage cabinets, duty desks and slop sinks should also be worked out.

4. Air ducts and other equipment unrelated to maintenance and repair should not be installed in the space above the generator units or within 2.2 m of the maintenance passageways on both sides of the generator units.

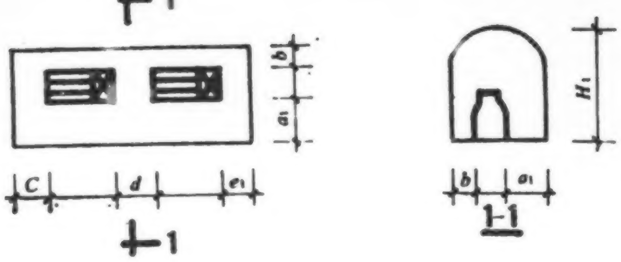


Figure 6-1. Parallel set-up

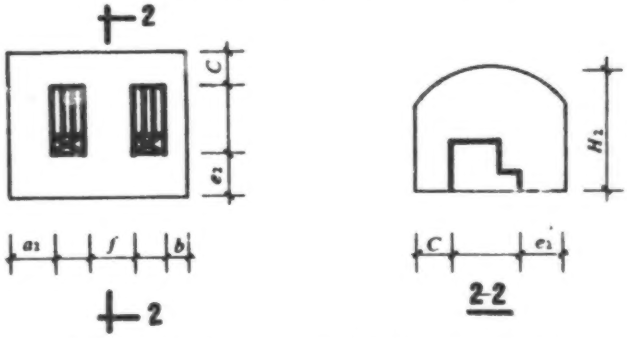


Figure 6-2. Perpendicular set-up

Table 6-4. Dimensions of Generator Rooms for Generator Units in Common Use (Meters)

Types of diesel engines			4125-C	4135D 6135D	4160 6160A	12V 135D
Rated capacity of Generator (KV)		below 40	50	40, 50 64, 75	60, 84 120	120
Working area (with transportation passages)	a_1	1.2	1.8	1.5	1.8	1.8
working area	a_2	1.2	1.8	1.5	—	1.2
lateral area	b	0.8	0.8	0.8	1.0	0.9
diesel engine end	c	1.0	1.2	1.2	2.0	1.2
interval between diesel engine and generator	d	1.2	1.5	1.5	2.0	1.8
generator end	e_1	1.0	1.2	1.2	1.5	1.8
generator end (with transportation passages)	e_2	1.5	1.5	1.5	—	1.9
interval between generator units	f	1.5	1.8	1.6	—	1.6
clear height of generator room	H_1		4.0	3.5	4.0	4.0
	H_2		4.3	4.0	—	4.3

Note 1: Values for c and d include dimensions of engine oil cooler

2: Dimensions of the generator room do not include the area occupied by ancillary equipment

6-5-3. The system for removing the fumes of the diesel engine should fulfill the following requirements:

1. The diameter, thickness and construction materials of the discharge flue should be determined by such factors as the type and model of the diesel engine, resistance to the allowed values for excess pressure from the shock waves, and heat resistance and corrosion resistance.

2. The discharge flue of the generator room should have a clearly designed overhead structure and effective heat-insulating materials, such that its surface temperature does not exceed 60°C.

3. When there are two or more generator units, the exhaust flues of all the diesel engines should merge into a single main flue. Each branch flue should be equipped with an exhaust valve. Flexible joints should be used to connect the exhaust ports of the diesel engines with the branch exhaust flues.

4. The slope of the discharge flue should not be less than 0.5 percent, and water drainage valuves should be installed at the lowest point of each section.

5. Procedures to prevent obstruction, or damage from rainwater or shock waves should be employed on those fume discharge flues that lead out of the tunnel area.

6. The shock wave-attentuation system for the fume exhaust of the power station should be determined by the allowable excess pressure for the generator unit in question.

6-5-4. Insofar as possible water cooling should be used for the lubricant cooling system of the diesel engine. Space should be allocated for storage of lubricants in the electric power station.

6-5-5. First aid and fire-fighting facilities should be maintained in the approximate rooms of the power station.

6-5-6. An intercom system is needed if the generator room is separate from the control room. If the generator room and control room are combined, a telephone and signal system is needed for communication with the main office.

6-5-7. The configuration of the control room should satisfy the following requirements:

1. The switchbox in the control room usually employs a single column arrangement. The width of the passageway in front of the switchbox should not be less than 1.5 m. For a switchbox installed away from the wall, the width for the passageway behind the switchbox should not be less than 0.8 m.

The height of the control room should be determined by the requirement that the safe distance from the highest point of the switchbox's upper exposed conductor to the ceiling of the tunnel cannot be less than 0.5 m. The clear height of a flat ceilinged chamber is generally not less than 2.5 m, and the height of a room with an arched ceiling is generally not less than 2.2 m.

2. Ventilation ducts and other equipment should not be installed above the switchbox. If other equipment or ducts have to be installed in the passageways in front

of or behind the control [room] switchbox, they must conform to the electric safety distances and not obstruct the maintenance crew.

3. Besides arranging for a switchbox and other power distribution equipment in the control room, space should be allocated for duty desks and electrician's supply cabinets. There should also be space reserved for a rest area for duty personnel in a suite or room adjoining the control room.

4. Installation of storage batteries inside the control room is strictly forbidden. The doors of the control room should open outward.

Section 6. Zero Grounding and [Direct] Grounding

6-6-1. A neutral point direct grounding system should be used for the generator and the transformer. Zero grounding protections should be adopted for the metal casings of electrical equipment, for metal structures, ductwork, shelters, and doors that are close to the charged circuits, and for the low-voltage output wire terminals of safety transformers.

6-6-2. Low voltage wires leading in from the external power sources should be grounded at the iron-footings of the insulator for the overhead line at its entrance to the tunnel. The zero [neutral] wire should be repeatedly grounded at the tunnel entrance. As for valve-type lighting arrestors, the iron footings of their insulators should be equipped with special nearby grounding device in addition to being connected to the main grounding device of the tunnel through the metal skins on power cables and grounding wires.

6-6-3. The following requirements for grounding to guard against static electricity should be followed in the case of fuel tanks and fuel pipelines:

1. Very good anti-static grounding should be used with metal fuel tanks and pipelines.

2. Reliable anti-static grounding procedures should be used for nonmetal fuel tanks, such as laying anti-static grounding conductors along the inner walls, and leading the conductors to a reliable ground outside of the tanks.

3. When there is a common ground for the anti-static grounding device and other grounding devices, its ground resistance must equate to the smallest value for resistance among the parts.

6-6-4. Grounding devices should meet the following requirements:

1. The structural steel reinforcing rod network of the tunnel should be fully exploited as a natural ground. When the actually measured grounding resistance value proves to be inadequate and when there is no structural steel reinforcing rod network available within the tunnel for grounding purposes, grounding poles can be driven into soil of low resistivity inside the tunnel, or artificial grounding bodies can be installed in the reservoirs, filter wells, or cesspools.

Grounding wires leading out from two different entrances should be used whenever it is difficult to install a ground inside the tunnel, or whenever an external ground has to be used because the ground resistance of a grounding device inside the project is inadequate.

2. If the structural steel reinforcing rod network is used as a ground, soldered joints should be used at the intersections of stress-bearing rods and the distributing rods. All joints in the grounding device should be firm and reliable.

3. Flat steel bars of 25 mm x 4 mm and round steel rods 12 mm in diameter are commonly used as grounding lines. The grounding lines should be regularly protected from rusting and sprayed with anti-corrosion paint.

6-6-5. The values for grounding resistance should not exceed those specified in Table 6-5.

Table 6-5. Grounding Resistance Values

Grounding Device		Ground Resistance (ohms)
Generators or transformers in parallel	total capacity 100 KVa	4
	total capacity 100 KVa	10
Grounding for high voltage equipment		10
Repeated ground and ground for anti-lightning equipment		10
Equipment grounding for static electricity		30

CSO: 8111/0573-P

END

JPRS 78899

3 September 1981

China Report

SCIENCE AND TECHNOLOGY

No. 124

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78899

3 September 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 124

CONTENTS

PEOPLES REPUBLIC OF CHINA

APPLIED SCIENCES

Dynamics of Attitude Control of Spin-Stabilized Satellite (Xing Guangqian; ZIDONGHUA XUEBAO, Jan 81) 1

ABSTRACTS

BUILDING CONSTRUCTION

JIANZHU [BUILDING CONSTRUCTION], No 7, 30 Jul 81 18

CONSTRUCTION MACHINERY

GONGCHENG JIXIE [CONSTRUCTION MACHINERY], No 6, 1981 20

ELECTRONICS

DIANZI JISHU [ELECTRONIC TECHNOLOGY], No 7, 20 Jul 81 22

DIANSHIJIE [ELECTRICAL WORLD], No 7, 1981 23

ENGINEERING

TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY], No 2, 1981 24

GEOCHEMISTRY

DIQIU HUAXUE [GEOCHIMICA], No 2, 1981 30

HYDROGEOLOGY

SHUIWEN DIZHI GONGCHENG DIZHI [HYDROGEOLOGY AND ENGINEERING GEOLOGY], No 3, 1981.. 39

MACHINERY

JIXIE ZHIZAO [MACHINERY], No 7, 1981.................................. 41

METALS

JINSHU RECHULI [HEAT TREATMENT OF METALS], No 6, 1981................. 42

JINSHU RECHULI [HEAT TREATMENT OF METALS], No 7, 1981................. 44

MICROBIOLOGY

WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA], No 2, 1981............ 45

OCEANOLOGY

HAIYANG XUEBAO [ACTA OCEANOLOGICA SINICA], No 2, Jun 81................ 47

TUNNEL ENGINEERING

DIXIA GONGCHENG [UNDERGROUND ENGINEERING], No 6, 1981.................. 49

UNDERGROUND ENGINEERING

DIXIE GONGCHENG [UNDERGROUND ENGINEERING], No 7, 1981.................. 51

VACUUM TECHNOLOGY

ZHENKONG [VACUUM], No 3, 1981.. 52

DYNAMICS OF ATTITUDE CONTROL OF SPIN-STABILIZED SATELLITE

Beijing ZIDONGHUA XUEBAO [ACTA AUTOMATICA SINICA] in Chinese Vol 7 No 1, Jan 81 pp 42-54

[Article by Xing Guangqian [6717 0342 6197] of the Beijing Control Engineering Institute: "Dynamics of Attitude Control of a Spin-Stabilized Satellite". This article was read at the National Space Control Technology Conference in April, 1979. The revised article was received on 30 July 1980.]

[Text] Abstract

This article discusses the dynamics of mechanical maneuvers to position a spin-stabilized satellite at any desired attitude. The article derives a set of analytic expressions of attitude movements of the satellite acted upon by a set of pulsed control moments of force. These formulas describe the patterns of change between the angular momentum, nutation angle, attitude phase angle and the controlling momentum and number of times of control. They can be directly applied in the design of satellite attitude control systems and attitude determination.

It must be pointed out that controlling the spin axis of the satellite to a position perpendicular to the plane of the orbit or controlling the spin axis towards the sun are two special cases of the results of this article.

I. Proposing the Problem

In the design of the attitude control system of the spin-stabilized satellite, because the auxiliary rocket on the satellite used for attitude control is fixed on the body of the satellite, therefore, as the satellite spins, the direction of the controlling moment of force produced by the auxiliary rocket will also rotate about the spin axis in space. According to the theorem of angular momentum of a rigid body, we know: "When a rotating body is acted upon by an external moment of force, the vector of its angular momentum will slant towards the direction of the moment of force." Therefore, to control the spin axis toward a desired direction, the rocket on the satellite can only be fired periodically and discontinuously, not continuously. At the same time, the following problems must be solved:

(1) How to select the phase of the discontinuous rocket control? What are the patterns?

(2) Within a definite cycle of discontinuous moments of force, what is the pattern of the attitude movements?

(3) The relationship between the moment of force, the number of times and the attitude movement parameters.

Discussion of the pattern of attitude movements under discontinuous moments of force is a mathematical discussion of the solution of a set of equations of Eulerian mechanics and kinematics describing the attitude movements. This problem can approximate the analytic solution of the problem within an allowable range of error. It is very important in both the design of the attitude control system and the attitude measuring system. It is also the problem that we want to study.

Let us assume that there is an inertial reference system $\{\hat{i},\hat{j},\hat{k},o\}$ on a unit spherical surface (See Figure 1). If we control the attitude A of the spin axis to C, we can generally do it in two ways: One is to travel along the great arc $\overset{\frown}{AmC}$, from A to C. The other route is to travel the so-called "isogonic" locus $\overset{\frown}{AnC}$. The name isogonic came about because the angle formed by the tangential direction of any point on the isogonic and the point's meridian is always the same. Obviously, the angle formed by the tangential direction of any point on the great arc and the point's meridian is not the same. Therefore, from the engineering point of view, the "isogonic" method of control is simpler than the great arc method, even though the distance traveled by the great arc method is shorter than the distance traveled by the "isogonic" method (therefore less fuel is consumed), but in engineering, the "isogonic" method of control is still preferred.

It can be seen from Figure 1 that when the desired attitude C is on the equatorial plane (for example, at the position B) or on the meridian plane (for example, at the position D), the locus of the great arc and the locus of the "isogonic" coincide, the isogonic angle of the desired attitude on the equatorial plane is 0 or π. In 1970, a German, Schmieder, published the research results of two types of special desired attitudes (1), the results were consistent with the results in a report written by this author (abbreviated as "the report" in the following)*. This article will mainly discuss the dynamics of controlling any desired attitude and will give an analytic solution of attitude dynamics for the controlling process using the "isogonic" method of control of any desired attitude. This analytic solution has not yet been seen in foreign publications. This problem has only been solved by a graphic geometric method (2) in studies of nutation control. The method we discuss is a completely analytic method. Of course, the results can also be represented by the graphic method.

---

*The report presented at the National Space Control Technology Conference in April, 1979.

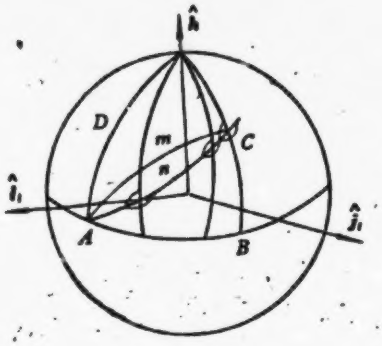


Figure 1. Loci of the attitude control by the great arc and the "isogonic" methods.

II. Analysis of the Dynamics of Attitude Control for Any Desired Attitude

In actual attitude control, because of the limitations of the attitude measuring components, we must consider the problem of "isogonic" control of any desired attitude. But the difficulty is that if the initial attitude and the desired attitude in the "isogonic" control method are not on the same plane, then an inertial attitude reference system cannot be found for describing the attitude in this inertial reference system and for finding an approximate analytic solution. To overcome this difficulty, we select a set of specific attitude parameters as the quantities of the attitude state and describe the attitude movement in this specific reference system, and finally we find the analytic solution of the problem.

Reference System

We establish the following reference system:

$R^I:\{\hat{i}_I,\hat{j}_I,\hat{k}_I,o\}$	The inertial reference system of the center of mass of the satellite, the center of the system is at the center of mass of the satellite and the system is parallel to the geocentric inertial system;
$R^s:\{\hat{i}_s,\hat{j}_s,\hat{k}_s,o\}$	Solar reference system of the center of mass of the satellite;
$R^h:\{\hat{i}_h,\hat{j}_h,\hat{k}_h,o\}$	Angular momentum reference system of the center of mass of the satellite;
$R^b:\{\hat{i}_b,\hat{j}_b,\hat{k}_b,o\}$	The coordinates system of the center of mass of the satellite itself.

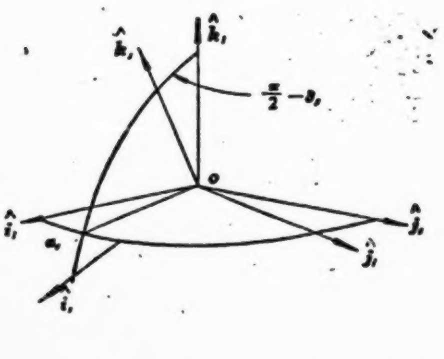


Figure 2. The inertial system of the center of mass of the satellite and the solar reference system

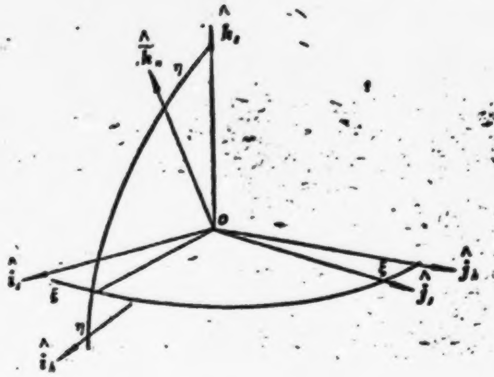


Figure 3. The solar reference system and the angular momentum reference system of the satellite

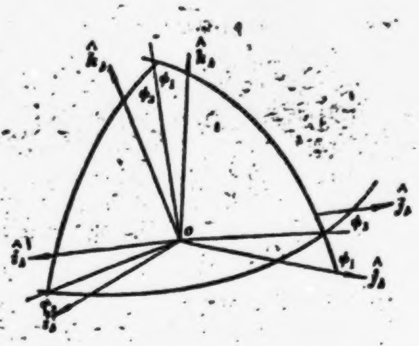


Figure 4. The angular momentum reference system of the satellite and the satellite's own reference system

The transformation of coordinates among the above coordinates systems are:

$$\begin{pmatrix}\hat{i}_s\\ \hat{j}_s\\ \hat{k}_s\end{pmatrix} = A_{sl}\begin{pmatrix}\hat{i}_l\\ \hat{j}_l\\ \hat{k}_l\end{pmatrix}, \tag{1}$$

$$A_{sl} = R_y\left(\frac{\pi}{2} - \delta_s\right) R_z(\alpha_s) \tag{2}$$

$$\begin{pmatrix}\hat{i}_h\\ \hat{i}_h\\ \hat{k}_h\end{pmatrix} = A_{hs}\begin{pmatrix}\hat{i}_s\\ \hat{j}_s\\ \hat{k}_s\end{pmatrix}, \tag{3}$$

$$A_{hs} = R_y(\eta) R_z(\xi), \tag{4}$$

$$\begin{pmatrix}\hat{i}_b\\ \hat{j}_b\\ \hat{k}_b\end{pmatrix} = A_{bh}\begin{pmatrix}\hat{i}_h\\ \hat{j}_h\\ \hat{k}_h\end{pmatrix}, \tag{5}$$

$$A_{bh} = R_z(\phi_3) R_y(\phi_2) R_z(\phi_1). \tag{6}$$

$R_x (\cdot)$, $R_y (\cdot)$, $R_z (\cdot)$ are respectively the transformation matrices of the single rotation coordinates about the x, y, z axis, their forms are:

$$R_x(\cdot) = \begin{pmatrix}1 & 0 & 0\\ 0 & \cos(\cdot) & \sin(\cdot)\\ 0 & -\sin(\cdot) & \cos(\cdot)\end{pmatrix}, \quad R_y(\cdot) = \begin{pmatrix}\cos(\cdot) & 0 & -\sin(\cdot)\\ 0 & 1 & 0\\ \sin(\cdot) & 0 & \cos(\cdot)\end{pmatrix},$$

$$R_z(\cdot) = \begin{pmatrix}\cos(\cdot) & \sin(\cdot) & 0\\ -\sin(\cdot) & \cos(\cdot) & 0\\ 0 & 0 & 1\end{pmatrix}. \tag{7}$$

2. Dynamic Equations

It is not difficult to derive the angular velocity ω_{bs} of R^h relative to R^s from the above transformation relationships of the coordinates

$$\omega_{bs} = \dot{\xi}\hat{k}_s + \dot{\phi}_1\hat{i}_h + (\dot{\eta} + \dot{\phi}_2\cos\phi_1)\hat{j}_h + \dot{\phi}_2\sin\phi_1\hat{k}_h + \dot{\phi}_3\hat{k}_b. \qquad (8)$$

Obviously, if the projection of ω_{bs} in R^b is written as ω_{bs}^b, then

$$\omega_{bs}^b = A_{bh}A_{hs}\begin{pmatrix}0\\0\\\dot{\xi}\end{pmatrix} + A_{bh}\begin{pmatrix}\dot{\phi}_1\\\dot{\eta} + \dot{\phi}_2\cos\phi_1\\\dot{\phi}_2\sin\phi_1\end{pmatrix} + \begin{pmatrix}0\\0\\\dot{\phi}_3\end{pmatrix} \qquad (9)$$

Let the inertial tensor I of the main axis of the satellite be

$$I = \begin{pmatrix}I_x & 0 & 0\\0 & I_y & 0\\0 & 0 & I_z\end{pmatrix}, \qquad (10)$$

then the angular momentum H in R^b is

$$H = I\omega_{bs}^b \qquad (11)$$

On the other hand, in R^b, the angular momentum is

$$H^h = \begin{pmatrix}0\\0\\h\end{pmatrix}, \qquad (12)$$

thus in R^b, the angular momentum H is

$$H = A_{bh}\begin{pmatrix}0\\0\\h\end{pmatrix}, \qquad (13)$$

Simultaneously solving equations (11) and (13) for ϕ_1, ϕ_2, ϕ_3,

$$\begin{aligned}\dot{\phi}_1 = \frac{1}{\cos\phi_2}\Big\{&\dot{\xi}[\sin\eta\cos\phi_2 + \cos\eta\sin\phi_2\cos\phi_1] + \dot{\eta}(-\sin\phi_2\sin\phi_1)\\&- h\sin\phi_2\cos\phi_1\left[\frac{\cos^2\phi_3}{I_x} + \frac{\sin^2\phi_3}{I_y}\right] + h\sin\phi_1\sin\phi_3\cos\phi_3\left(\frac{1}{I_x} - \frac{1}{I_y}\right)\Big\},\end{aligned} \qquad (14)$$

$$\begin{aligned}\dot{\phi}_2 = &-\dot{\xi}\cos\eta\sin\phi_1 - \dot{\eta}\cos\phi_1 - \sin\phi_2\cos\phi_1\cos\phi_3\sin\phi_3 h\left[\frac{1}{I_x} - \frac{1}{I_y}\right]\\&+ \sin\phi_1 h\left[\frac{\sin^2\phi_3}{I_x} + \frac{\cos^2\phi_3}{I_y}\right],\end{aligned} \qquad (15)$$

$$\phi_3 = \frac{h}{I_z}\cos\phi_2\cos\phi_1 - \dot{\xi}\cos\eta\cos\phi_1\frac{1}{\cos\phi_2} + \dot{\eta}\frac{\sin\phi_1}{\sin\phi_2} + h\,\mathrm{tg}\,\phi_2 \cdot$$
$$\cdot \sin\phi_2\cos\phi_1\left(\frac{\cos^2\phi_3}{I_z} + \frac{\sin^2\phi_3}{I_y}\right) - h\sin\phi_1\sin\phi_3\cos\phi_3\,\mathrm{tg}\,\phi_2\left(\frac{1}{I_z} - \frac{1}{I_y}\right). \tag{16}$$

Everyone knows that the dynamic equations of the angular momentum in R^h are:

$$\frac{dH^h}{dt} = \frac{\partial H^h}{\partial t} + \omega_{ht} \times H^h = M^h, \tag{17}$$

where

$$H^h = \begin{pmatrix} 0 \\ 0 \\ h \end{pmatrix}, \tag{18}$$

$$\omega_{ht} = \begin{pmatrix} -\sin\eta\dot{\xi} \\ \dot{\eta} \\ \cos\eta\dot{\xi} \end{pmatrix}. \tag{19}$$

M^h is the projection of the controlling moment of force in R^h.

We can write equation (17) in component form and substitute it into equations (1^A -- 16) and simplify to obtain the complete set of dynamic equations describing the attitude movement:

$$\dot{\xi} = \frac{M_y^h}{h\sin\eta}, \tag{20}$$

$$\dot{\eta} = \frac{M_z^h}{h}, \tag{21}$$

$$\dot{h} = M_z^h, \tag{22}$$

$$\dot{\phi}_1 = -h\,\mathrm{tg}\,\phi_2\cos\phi_1\left[\frac{\cos^2\phi_3}{I_z} + \frac{\sin^2\phi_3}{I_y}\right] + \frac{h\sin\phi_1\sin\phi_3\cos\phi_3}{\cos\phi_2}\left[\frac{1}{I_z} - \frac{1}{I_y}\right]$$
$$+ [\sin\eta + \cos\eta \cdot \mathrm{tg}\,\phi_2\cos\phi_1]\frac{M_y^h}{h\sin\eta} - \mathrm{tg}\,\phi_2\sin\phi_1\frac{M_z^h}{h}, \tag{23}$$

$$\dot{\phi}_2 = \sin\phi_1\left[\frac{\sin^2\phi_3}{I_z} + \frac{\cos^2\phi_3}{I_y}\right]h - \cos\phi_1\sin\phi_2\sin\phi_3\cos\phi_3 h\left[\frac{1}{I_y} - \frac{1}{I_y}\right]$$
$$- \cos\eta\sin\phi_1\frac{M_y^h}{h\sin\eta} - \cos\phi_1\frac{M_z^h}{h}, \tag{24}$$

$$\dot{\phi}_3 = \frac{h}{I_z}\cos\phi_2\cos\phi_1 + h\,\mathrm{tg}\,\phi_2\sin\phi_1\cos\phi_1\left[\frac{\cos^2\phi_3}{I_z} + \frac{\sin^2\phi_3}{I_y}\right]$$
$$- h\sin\phi_1\sin\phi_3\cos\phi_3\,\mathrm{tg}\,\phi_2\left(\frac{1}{I_z} - \frac{1}{I_y}\right)$$
$$- \cos\eta\cos\phi_1\frac{M_y^h}{h\sin\eta\cos\phi_2} + \frac{\sin\phi_1 M_z^h}{\cos\phi_2 h}. \tag{25}$$

If the satellite is a symmetrically rotating body, i.e., when $I_x = I_y$ then equations (20 - 25) can be simplified as:

$$\dot{\xi} = \frac{M_y^h}{h \sin \eta}, \tag{26}$$

$$\dot{\eta} = \frac{M_z^h}{h}, \tag{27}$$

$$\dot{h} = M_x^h, \tag{28}$$

$$\dot{\phi}_1 = -\frac{h}{I_{II}} \operatorname{tg} \phi_2 \cos \phi_1 + [1 + \operatorname{ctg}\eta \operatorname{tg} \phi_2 \cos \phi_1] \frac{M_y^h}{h} - \operatorname{tg} \phi_2 \sin \phi_1 \frac{M_z^h}{h}, \tag{29}$$

$$\dot{\phi}_2 = \frac{h \sin \phi_1}{I_{II}} - \operatorname{ctg} \eta \sin \phi_1 \frac{M_y^h}{h} - \cos \phi_1 \frac{M_z^h}{h}, \tag{30}$$

$$\dot{\phi}_3 = \frac{h}{I_z} \cos \phi_2 \cos \phi_1 + \frac{h}{I_{II}} \operatorname{tg} \phi_2 \sin \phi_2 \cos \phi_1 - \operatorname{ctg} \eta \frac{\cos \phi_1}{\cos \phi_2} \frac{M_y^h}{h} + \frac{\sin \phi_1 M_z^h}{\cos \phi_2 h}. \tag{31}$$

where

$$I_{II} = I_x = I_y . \tag{32}$$

3. Attitude Movements Under the Isogonic Pulse Moment of Force

First we examine the moments of force acting upon the satellite. As illustrated in Figure 5, in general, the attitude control rocket tube is fitted parallel to the spin axis and is at a distance from the spin axis, this distance is the arm of force.

As Figure 5 shows, because the rocket for attitude control on the satellite is fixed to the body of the spin satellite, therefore when the satellite makes one revolution, the attitude control moment of force of the rocket M also makes one revolution in space. Thus, to control the attitude control moment of force to a direction perpendicular to the plane of the spin axis, a known phase reference base must be given.

If we select the pulse at the line between the meridian plane of the satellite and the sun as the standard of the reference phase, then $\hat{k}_I$ in Figure 1 should represent the vector $\hat{s}$ of the direction of the sun. We call the angle made by the spin axis--the vector plane of the direction of the sun and the spin axis--the plane of the controlling moment of force the "phase angle of the controlling moment of force", and use β to represent it. In this way, the so-called "isogonic" control becomes a control of the phase angle β of the controlling moment of force so that it equals a certain constant. This constant is determined by the initial attitude and the desired attitude. We know that during a certain period of rocket maneuvers the combined moment of force of the rocket must be pointed towards the desired direction. Theoretically, the shorter the duration of rocket maneuvers the better, but for the machinery executing the maneuvers, the shorter the duration of maneuvers the poorer the repeatability, and the more difficult it is to develop.

But, a long duration of maneuvers wastes fuel. According to analysis, it is best to choose a maneuvering angle (i.e., the product of the duration of the maneuver and the velocity of rotation of the satellite) of 45° to 60°. For convenience of analysis and in order not to lose generality, we assume that the controlling moment of force is in ideal pulses, and it is described mathematically by the δ function.

As Figure 5 shows, the phase angle of the line between the rocket tube and the meridian of the solar sensor is β_j, therefore the moment of force in R^b is:

$$M = \begin{pmatrix} \cos\left(\beta_j - \frac{\pi}{2}\right) \\ \sin\left(\beta_j - \frac{\pi}{2}\right) \\ 0 \end{pmatrix} |M| = \begin{pmatrix} \sin\beta_j \\ -\cos\beta_j \\ 0 \end{pmatrix} |M|. \qquad (33)$$

The forms of the components in R^h are:

$$M^h = A_{hb}^{-1} M = R_z(-\phi_1) R_x(-\phi_2) R_z(-\phi_3) \begin{pmatrix} \sin\beta_j \\ -\cos\beta_j \\ 0 \end{pmatrix} |M|, \qquad (34)$$

Because the controlling moment of force is very small, the attitude variation thus caused can be regarded as a first order infinitesimal quantity,

$$\phi_1 = 0 \qquad \phi_2 = 0 \qquad (35)$$

At the same time, we assume the meridian line of the solar sensor sees the sun at time t_s, the pulsed action of the controlling moment of force occurs τ_s after t_s, if the moment of force is regarded as an ideal pulse, then equation (34) can be simplified as:

$$M^h = \begin{pmatrix} \sin(\phi_3 + \beta_j) \\ -\cos(\phi_3 + \beta_j) \\ 0 \end{pmatrix} |M| \delta(t - t_s - \tau_s). \qquad (36)$$

In the following, we will discuss the time of occurrence of the pulse of the solar line. In R^h, the directional vector $\hat{s}$ of the sun and the spin axial vector $\hat{p}$ are:

$$\hat{s} = A_{hs} \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -\sin\eta \\ 0 \\ \cos\eta \end{pmatrix}, \qquad (37)$$

$$\hat{p}^{h} = R_z(-\phi_3)\begin{pmatrix}0\\0\\1\end{pmatrix} = \begin{pmatrix}0\\0\\1\end{pmatrix}, \qquad (38)$$

$$\hat{j}_b^{h} = R_z(-\phi_3)\begin{pmatrix}0\\1\\0\end{pmatrix} = \begin{pmatrix}-\sin\phi_3\\\cos\phi_3\\0\end{pmatrix}, \qquad (39)$$

$$\hat{i}_b^{h} = R_z(-\phi_3)\begin{pmatrix}1\\0\\0\end{pmatrix} = \begin{pmatrix}\cos\phi_3\\\sin\phi_3\\0\end{pmatrix}. \qquad (40)$$

Obviously, the solar pulse should satisfy the following conditions:

$$\begin{cases}\hat{s}^{h}\cdot\hat{j}_b^{h} = 0\\ \hat{s}^{h}\cdot\hat{i}_b^{h} \geqslant 0\end{cases} \qquad (41)$$

These are expanded to become:

$$\begin{cases}\sin\phi_1\sin\eta = 0\\ -\sin\eta\cos\phi_3 \geqslant 0\end{cases} \qquad (42)$$

Substituting equation (36) into equation (28) and equation (31) and neglecting the higher order infinitesimal quantities, we obtain:

$$\phi_3 = \frac{h}{I_z} = \Omega. \qquad (43)$$

If $\phi_3 = 0$ when $t = 0$ (44)

then $\phi_3 = \Omega t$ (45)

Substituting equation (45) into equation (42), we obtain:

$$\phi_3 = \pi,\ 3\pi,\ 5\pi,\ \cdots(2n-1)\pi,\quad (n = 1, 2, 3\cdots).$$

Obviously, the above angle is the ϕ_3 value when the solar pulse occurs, its corresponding time is:

$$t_{s_1} = \frac{\pi}{\Omega},\ t_{s_2} = \frac{3\pi}{\Omega},\ t_{s_3} = \frac{5\pi}{\Omega},\ \cdots\ t_{s_n} = \frac{(2n-1)\pi}{\Omega}. \qquad (46)$$

In the following, we will discuss the pattern of the isogonic control moments of force.

According to Figure 5, we know from the geometric relationship between the rocket tube and the line of the meridian plane of the solar sensor that if the rocket is activated at the time the solar pulse occurs, then the control phase angle is:

$$\beta = \beta_i - \frac{\pi}{2},$$

Assume that the time the rocket is activated is later than the solar pulse by τ_s, then the control phase angle β is:

$$\beta = \beta_i - \frac{\pi}{2} + \Omega\tau_s \tag{47}$$

i.e.,

$$\Omega\tau_s = \beta - \beta_i + \frac{\pi}{2}$$

Considering equations (45), (46) and (47), obviously we have

$$\phi_3 = (t - t_{i_1})\Omega + \pi.$$

When

$$t = t_{i_1} + \tau_s$$

then

$$\phi_3 = \tau_s\Omega + \pi = \beta - \beta_i + \frac{\pi}{2} + \pi.$$

Similarly, when

$$t = t_{i_2} + \tau_s$$

$$\phi_3 = 2\pi + \beta - \beta_i + \frac{\pi}{2} + \pi.$$

$$t = t_{i_n} + \tau_s$$

$$\phi_3 = (n - 1)2\pi + \beta - \beta_i + \frac{\pi}{2} + \pi. \tag{48}$$

Using equation (48), equation (36) becomes

$$M_k^h = \sum_{\tau=1}^{k} \begin{pmatrix} \cos(\beta - \pi) \\ \sin(\beta - \pi) \\ 0 \end{pmatrix} |M| \delta(t - t_{i_k} - \tau_s) = \begin{pmatrix} M_x^h \\ M_y^h \\ M_z^h \end{pmatrix}. \tag{49}$$

Because, in control maneuvers, the controlling moment of force is not large, and at the same time, the action time is short, therefore it can be regarded that the impulse moment of each pulse is a first order infinitesimal quantity, i.e., we can assume the impulse of each pulse moment of force causing the angular momentum of the satellite to move an arc length of ΔS is

$$\int_0^t \frac{|M|}{h} \delta(\tau - t_i - \tau_s) d\tau = \Delta S. \tag{50}$$

Again neglecting higher order infinitesimal quantities, equations (26-31) can be simplified into the following linear equations:

$$\dot{\xi} = \frac{M_y^h}{h\sin\eta}, \tag{51}$$

$$\dot{\eta} = \frac{M_x^h}{h}, \tag{52}$$

$$\dot{h} = M_z^h, \tag{53}$$

$$\dot{\phi}_1 = -\frac{h}{I_z}\mu\phi_2 + \frac{M_y^h}{h}, \tag{54}$$

$$\dot{\phi}_2 = \frac{h}{I_z}\mu\phi_1 - \frac{M_x^h}{h}, \tag{55}$$

$$\dot{\phi}_3 = \frac{h}{I_z}; \quad \left(\mu = \frac{I_z}{I_x}\right). \tag{56}$$

Let us assume that at t = 0, the initial conditions are:

$$\begin{cases} \xi = \xi_0 \\ \eta = \eta_0 \\ h = I_z\Omega = h_0, \end{cases} \tag{57}$$

$$\begin{cases} \phi_1 = 0 \\ \phi_2 = 0 \\ \phi_3 = 0. \end{cases} \tag{58}$$

Thus, the attitude movement before and after the first pulse moment of force acts is as follows: When $0 \leqslant t < t_{si} + \tau_s$, we solve equations (51 - 53) and obtain:

$$\eta = \eta_0, \quad \xi = \xi_0, \quad h = h_0 = \Omega I_z. \tag{59}$$

When $t_{s_1} + \tau_s \leqslant t < t_{s_2} + \tau_s,$

If we consider the expression of the moment of force in equation (49), then from equations (51) and (52) we have

$$\eta_1 = \eta_0 + \Delta S\cos(\beta - \alpha) \tag{60}$$

$$\frac{d\eta}{d\xi} = \frac{M_x^h}{M_y^h}\sin\eta = \mathrm{ctg}\,\beta\cdot\sin\eta$$

By integration:

$$\xi_1 = \xi_0 + \mathrm{tg}\,\beta\ln\left\{\frac{\mathrm{tg}\,\frac{\eta_1}{2}}{\mathrm{tg}\,\frac{\eta_0}{2}}\right\} \tag{61}$$

It is not difficult to generalize the above results to the ξ and η after the kth pulse moment of force acts. If before the kth pulse acts,

$$\eta = \eta_{k-1}, \quad \xi = \xi_{k-1} \tag{62}$$

then after the kth pulse acts

$$\begin{cases} \eta_k = \eta_{k-1} + \Delta S\cos(\beta - \alpha) \\ \xi_k = \xi_{k-1} + \operatorname{tg}\beta \ln\left\{\dfrac{\operatorname{tg}\dfrac{\eta_k}{2}}{\operatorname{tg}\dfrac{\eta_{k-1}}{2}}\right\}, \end{cases} \quad (t_{s_k} + \tau_s \leqslant t < t_{s_{k+1}} + \tau_s) \tag{63}$$

In the following, we obtain ϕ_1, ϕ_2 from equations (54) and (55). Let

$$z = \phi_1 + \phi_2 i \tag{64}$$

then we change equations (54) and (55) into a complex number form:

$$\begin{cases} \dot{z} = \dfrac{h}{I_x}\mu z i + \dfrac{|M|}{h}\delta(t - t_{s_k} - \tau_s)e^{i(\beta - \frac{1}{2}\pi)} \\ z(t_{s_{k-1}} + \tau_s) = z_{(k-1)}, \quad (t_{s_{k-1}} + \tau_s \leqslant t < t_{s_k} + \tau_s) \end{cases}, \tag{65}$$

It is not difficult to write equation (65) as

$$z(t) = z(k-1)e^{\Omega\mu i(t - t_{s_{k-1}} - \tau_s)}, \quad (t_{s_{k-1}} + \tau_s \leqslant t < t_{s_k} + \tau_s) \tag{66}$$

$$z(t) = z(k) = z_{(k-1)}e^{\Omega\mu i T} + \Delta S e^{i(\beta - \frac{1}{2}\pi)} \quad (t = t_{s_k} + \tau_s) \tag{67}$$

According to the known condition z(0) = 0

$$\begin{aligned} &z(1) = \Delta S e^{i(\beta - \frac{1}{2}\pi)}, \\ &z(2) = z(1)e^{\Omega\mu T i} + \Delta S e^{i(\beta - \frac{1}{2}\pi)}, \\ &z(3) = z(2)e^{\Omega\mu T i} + \Delta S e^{i(\beta - \frac{1}{2}\pi)}, \\ &\cdots \\ &z(n) = z(n-1)e^{\Omega\mu T i} + \Delta S e^{i(\beta - \frac{1}{2}\pi)}. \end{aligned}$$

Therefore

$$\begin{aligned} z(n+1) &= \Delta S e^{i(\beta - \frac{1}{2}\pi)}\{e^{\Omega\mu T i n} + e^{\Omega\mu T i(n-1)} + \cdots + 1\} \\ &= \Delta S e^{i(\beta - \frac{1}{2}\pi)}\left\{\frac{1 - e^{\Omega\mu T i(n+1)}}{1 - e^{\Omega\mu T i}}\right\}, \end{aligned} \tag{68}$$

where $T = \dfrac{2\pi}{\Omega}$.

In addition, we can also write equation (63) in a nonrecurrent form

$$\begin{cases} \eta_n = \eta_0 + n\Delta S \cos(\beta - \pi) & (69) \\ \xi_n = \xi_0 + \operatorname{tg}\beta \left\{ \ln\left(\dfrac{\operatorname{tg}\dfrac{\eta_n}{2}}{\operatorname{tg}\dfrac{\eta_0}{2}} \right) \right\} & (70) \end{cases}$$

The conditions for equations (69) and (70) to be valid is $\eta_n = \eta_0$.
When $\eta_n = \eta_0$, according to equations (51 - 56) and equation (49), because at this time

$$\beta = \frac{\pi}{2}, \quad \beta = \frac{3}{2}\pi \qquad (71)$$

therefore

$$\xi_k = \xi_{k-1} + \frac{\sin(\beta - \pi) \cdot \Delta S}{\sin \eta_0}, \quad (t_{sk} + \tau_s \leq t < t_{sk+1} + \tau_s). \qquad (72)$$

The noncurrent form of equation (72) is

$$\xi_n = \xi_0 + n \cdot \Delta S \frac{\sin(\beta - \pi)}{\sin \eta_0}, \quad (t_{sk} + \tau_s \leq t < t_{sk+1} + \tau_s). \qquad (73)$$

From equations (67) and (68), the time after the nth pulse moment of force acts is

$$\dot{z}(n) = \Delta S e^{i(\beta - \frac{1}{2}\pi)} \left\{ \frac{1 - e^{\Omega\mu T i n}}{1 - e^{\Omega\mu T i}} \right\}, \quad (t = t_{sn} + \tau_s) \qquad (74)$$

Before the n + 1 pulse moment of force, and after the nth pulse moment of force,

$$z(t) = z(n) e^{\Omega\mu i(t - t_{sn} - \tau_s)}, \quad (t_{sn} + \tau_s \leq t < t_{sn+1} + \tau_s) \qquad (75)$$

because

$$\frac{1 - e^{2n\mu\pi i}}{1 - e^{2\pi\mu i}} = \frac{1 - e^{2n\pi(\mu-1)i}}{1 - e^{2\pi(\mu-1)i}} = \frac{\sin(\mu - 1)n\pi}{\sin(\mu - 1)\pi} \cdot e^{(\alpha_n - \alpha_1)i} \qquad (76)$$

$$\alpha_n = (\mu - 1)n\pi - \frac{\pi}{2} \qquad (77)$$

$$\alpha_1 = \pi(\mu - 1) - \frac{\pi}{2} \qquad (78)$$

Substituting equations (80 - 82) into equation (78) we obtain

$$z(n) = \Delta S \frac{\sin(\mu - 1)n\pi}{\sin(\mu - 1)\pi} e^{i(\beta - \frac{1}{2}\pi + (n-1)(\mu-1)\pi)} \qquad (79)$$

4. The Graphic Geometric Method and the Physical Significance of the Attitude Loci

It is not difficult to see from a comparison of the results of equations (69), (70), (71), (72) and (79) and the content of "the report" or reference (1) that the results obtained in this article are the direct generalization of the contents in "the report" or reference (1). The question discussed in "the report" and reference (1) is the special case when the control phase angle β of the desired attitude equals 0, π, and $\frac{\pi}{2}$, $\frac{3}{2}\pi$. As long as we let β equal to the above angle, the corresponding equations (75) and (76) which give the angular momentum coordinates are the coordinates of the angular momentum of the satellite described in "the report" or reference (1). At the same time, equation (83) gives the nutation radius

$$|z_{(n)}| = \frac{\sin(\mu-1)n\pi}{\sin(\mu-1)\pi}\Delta S. \qquad (80)$$

which is exactly the same as the nutation radius given in "the report" or reference (1).

To describe the attitude movement visibly, we can use the graphic geometric method to draw the loci of the vector and of the spin axis on the ϕ_1-ϕ_2 plane.

Example 1.

$$\beta = \frac{3}{2}\pi + \frac{\pi}{4},\ \mu = 1.25,\ \xi_0 = 0,\ \eta_0 = \frac{\pi}{2},$$
$$\Delta S = 0.1,$$

Utilizing equations (69), (70), (71), (72), the angular momentum coordinates are:

$t = t_1,$	$\eta_1 = 1.5$	$t = t_5,$	$\eta_5 = 1.2172$
	$\xi_1 = 0.07076,$		$\xi_5 = 0.3611,$
$t = t_2$	$\eta_2 = 1.4293$	$t = t_6$	$\eta_6 = 1.4650$
	$\xi_2 = 0.1418,$		$\xi_6 = 0.4375,$
$t = t_3$	$\eta_3 = 1.3586$	$t = t_7$	$\eta_7 = 1.0758$
	$\xi_3 = 0.21374,$		$\xi_7 = 0.5165,$
$t = t_4$	$\eta_4 = 1.2879$	$t = t_8$	$\eta_8 = 1.005$
	$\xi_4 = 0.2869,$		$\xi_8 = 0.5985,$

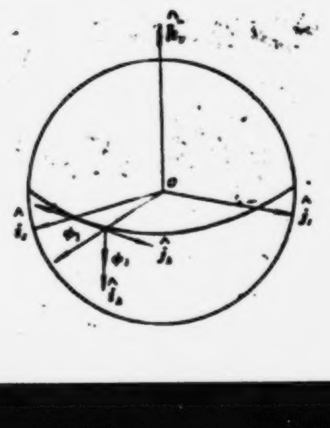


Figure 6. Relationship between the vectors of the ϕ_1 - ϕ_2 coordinates and the $\hat{i}_h$ $\hat{j}_h$ $\hat{k}_h$ coordinates system.

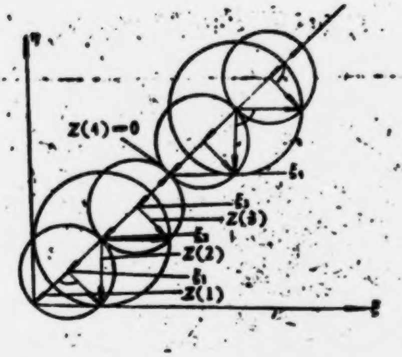


Figure 7. The phase diagram of the $\mu = 1.25, \beta = \frac{3}{2}\pi + \frac{\pi}{4}$ attitude movement in $\phi_1 - \phi_2$.

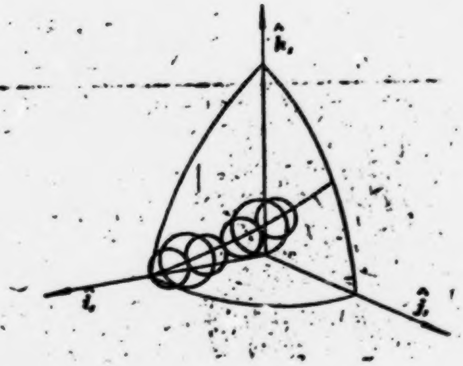


Figure 8. The loci of the vector end of the spin axis on the unit attitude spherical surface at $\mu = 1.25\ \beta = \frac{3}{2}\pi + \frac{\pi}{4}$

Pattern of the phase angles:

$$
\begin{array}{ll}
z_{(1)} = \Delta S e^{i\frac{\pi}{4}}, & z_{(5)} = \Delta S e^{i\frac{\pi}{4}} + z_{(4)} e^{i\frac{\pi}{2}}, \\
z_{(2)} = \Delta S e^{i\frac{\pi}{4}} + z_{(1)} e^{i\frac{\pi}{2}}, & z_{(6)} = \Delta S e^{i\frac{\pi}{4}} + z_{(5)} e^{i\frac{\pi}{2}}, \\
z_{(3)} = \Delta S e^{i\frac{\pi}{4}} + z_{(2)} e^{i\frac{\pi}{2}}, & z_{(7)} = \Delta S e^{i\frac{\pi}{4}} + z_{(6)} e^{i\frac{\pi}{2}}, \\
z_{(4)} = \Delta S e^{i\frac{\pi}{4}} + z_{(3)} e^{i\frac{\pi}{2}}, & z_{(8)} = \Delta S e^{i\frac{\pi}{4}} + z_{(7)} e^{i\frac{\pi}{2}}.
\end{array}
$$

Figure 7 shows the phase diagram of the data in example 1 on $\phi_1 - \phi_2$.

To describe the attitude movement visibly, we can draw the loci of the vector end of the spin axis on the unit attitude spherical surface using the data in example 1. The loci are shown in Figure 8.

III. Comparison of the Results of Nonlinear Calculations

To examine whether the linear approximate analytic solution is applicable or not, we have obtained the numerical solution of the nonlinear equations of Eulerian dynamics on the digital computer and compared the results with the results obtained by the linear analytic equations. A set of results are copied here and listed in Table 1. Their detailed description is given in "the report".

Table 1

Symbol	Unit	Type / Value / $\Omega\tau$ Degree	30	90	120
R^*_{max}	Radian	Linear	0.306×10^{-3}	0.913×10^{-3}	1.21×10^{-3}
		Nonlinear	0.306×10^{-3}	0.913×10^{-3}	1.21×10^{-3}
θ^*	Degree	Linear	0	0	0
		Nonlinear	−1.1	−1.77	−2.58
k	Times	Linear	733	268	219
		Nonlinear	733	268	218
t_s	Second	Linear	244.3	89.3	73.0
		Nonlinear	244.3	89.3	72.6
θ	Kilogram	Linear	0.873	0.957	1.043
		Nonlinear	0.873	0.957	1.043

R^*_{max}	(radian):	Largest nutation radius of the control process;
θ^*	(degree):	Angle of θ^* as ψ^* advances 90° when the satellite is acted upon by the controlling moment of force;
k	(times):	The number of pulses needed to make the satellite's $\psi^* = 90°$.
t_s	(seconds):	Duration of time for the satellite's $\psi^* = 90°$.
Ω	(kilograms):	The amount of exhaust needed to make the satellite's $\psi^* = 90°$.

The comparison of the computed results shows that the linear analytic solution is a very good approximate solution and it is completely suitable for engineering design.

It can be clearly seen from Table 1 that the different fan shaped angles swept by the exhaust ($\Omega\tau$ = 30°, 90°, 120°) correspond to the different angles of exhaust when ψ^* varies from 0° → 90°. The values of R^*_{max}, k, t_e, θ are basically the same, the only difference is θ^*, in the linear approximate solution, $\theta^* = 0$ while the nonlinearity makes the values of the different angles of exhaust θ^* slightly different. Generally speaking, the larger the $\Omega\tau$, the larger the θ^*. Even so, the change in θ^* is not large, for designing attitude control, such precision is entirely sufficient.

In addition, this article also studied the effects of different values of μ, different external moments of force, different velocities of rotation upon the parameters R^*_{max}, θ^*, k, t_e and θ under the different linear and nonlinear models, and their differences were compared. All of these results show the linear approximate analytic solution can be used in design, because the error caused by linearization is allowable within the range of precision of the problem discussed. For details, refer to the "report".

IV. Conclusion

(1) This article derived the approximate analytic solution of the attitude movement of mechanical maneuvers to position the spin satellite towards any desired target under "isogonic" control patterns.

(2) If the swept fan shaped angle of the exhaust is not larger than 30°, then when the desired attitude is reached, the error of control produced by the solution given by the linear model is only 1 percent to 2 percent of the advance of the desired attitude. Such errors of the model are allowable in the design of attitude control.

(3) In the analytic solution of the attitude, if we let $\beta = \frac{3}{2}\pi$ in equations (69), (70), (71), (72) and (79), we obtain the conclusion in "the report" or reference (1).

(4) The pattern of variation of the angular momentum in the course of control mainly relies upon the ratio μ of the vertical and horizontal inertia. Equation (79) actually describes the pattern of variation. According to this pattern, we can suitably select μ so that the periodically occurring nutation radius is zero, and on the other hand, after the inertia has been selected, we can also suitably select the number of times of control in attitude control so that after controlling maneuvers, the nutation radius is the smallest.

(5) The analytic solution of the attitude movement can directly be applied to the design of the spin satellite attitude control plan. According to this solution, we can conveniently determine the number of times of control. At the same time, this solution is also necessary in two-pulse control or nutation control.

(6) The analytic solution of the attitude movement can also be used to measure the attitude of the satellite, especially to measure nutation.

(7) We can utilize the analytic solution of the attitude to make a closed circuit attitude control system with an attitude feedback function. This means, we can utilize the attitude information sent by the satellite to determine the attitude in the control process, then we can feed back the estimated attitude to the attitude logic design and correct the attitude control logic in time.

The first draft of this article was reviewed by Mr Guang Zhaozhi [7070 5128 4160] and Comrade Bi Dachuan [3968 1129 1557] of the Systems Science Institute of the Chinese Academy of Sciences, and they expressed their precious opinions. Thanks.

References

(1) Schmieder, Optimum Performance of Symmetrically Rotating Spin-stabilized Bodies Dependent On the Relationship of Inertial Moments in Space Voyage Research, Vol. XIV, No 3, 1970, May-June.

(2) Murakami Chikara, Nakajima Atsui: Kinematic Control of Gas Jet Nutation of the Symmetrical Spin Satellite, NAL TR-344, 1973.

9296
CSO: 8111/1083

AUTHOR: None

ORG: None

TITLE: "Answers of Someone in Charge of a Related Department of the State's Bureau of Construction Engineering to Questions of a Reporter of the Journal Concerning Creative Superachievements"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 7, 30 Jul 81 pp 1-3

ABSTRACT: After the award meeting of the Beijing, Tianjin, and Tangshan Creative Superachievements Construction Competition, a reporter of the journal interviewed someone in charge of a related department of the State's Bureau of Construction Engineering asking about such problems as the method of further developing the competition activity. The official in charge provided some data to illustrate the accomplishments of the construction engineering system of the country (a State-operated enterprise. In 1980, 44,470,000m^2 of buildings were completed, and 5,916 buildings reached the creative superachievement level covering 12,910,000 m^2. Beijing was rated the best, with 86.6 percent reaching the award-winning level. It was above 40 percent for Tianjin, Shanghai, Liaoning, Jilin, and Yunnan; above 30 percent for Hebei and Shandong. Local superior engineering demonstrative projects were created in Shaanxi, Gansu, Xinjiang, Hubei, Zhejiang, Fujian, Shandong, and Guangdong. He credited scientific management, cost contracting, and various forms of work competition for these achievements.

AUTHOR: None

ORG: Bureau of Construction Operation, National Bureau of Construction Engineering

TITLE: "Department of Construction Made Great Contribution to Four Modernizations"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 7, 30 Jul 81 pp 6-7

ABSTRACT: On this day of the 60th anniversary of the birth of the Chinese Communist Party, it should be meaningful to review the accomplishments of the construction industry in the past 30 years. Following a brief history of various large plants all over the country being constructed very quickly, less than half of the time stipulated in the plan in some cases, the paper provides the following data: (1) From 1953 to 1980, the area of completed construction is 7.5×10^8 m^2, of which more than 50 percent are residential. (2) In 1980, the nation's construction team is composed of 3.2 million persons, 5.7 times the size of 1953. (3) There are 799 construction enterprises in 1980, 2.4 times the number in 1953. (4) The labor productivity in 1980 is 5,013 yuan/person, 83.3 percent higher than that of 1953.

AUTHOR: WANG Zhe [3769 0772]
WU Baozhong [0702 1405 1813]

ORG: None

TITLE: "Comprehensive Utilization of Autoigniting Gangue"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 7, 30 Jul 81 p 15

ABSTRACT: There are many coal mines in Liaoning Province and every year a gigantic quantity of gangue is discarded. The amount discarded by Fouxin Coal Mine every year is about 2.3 million tons and there is a mountain-like accumulation, weighing 13×10^8 tons. A large area of land is taken by the gangue, which is a harmful pollutant. The Liaoning Provincial Bureau of Construction Engineering arranged for the Liaoning Provincial Research Institute of Construction Science to begin studying its comprehensive utilization in 1978, with the cooperation of other related organizations, emphasizing the feasibility of using gangue (1) as a light aggregate with ordinary cement as the adhesive material; (2) to make a powder (the autoigniting gangue of Fouxin) for mixing concrete to save some cement for the purpose of energy conservation; (3) to make autoigniting gangue reinforced concrete members to test its property under prolonged load bearing conditions. Following 3 years of research a production line has been established. The Fouxin Construction Member Plant is now using a large quantity of gangue to make floor boards and wall boards, which have been used to construct more than 30 residential dwellings, totaling 60,000 m^2. These boards have been scientifically certified as being light, strong, of good insulating property. The paper includ photos depicting gangue being extracted and a building constructed of gangue wall boards.

AUTHOR: YAN Ding [0917 0002]

ORG: None

TITLE: "An Underground Giant Dragon Cuts Across Yongjiang "

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 7, 30 Jul 81 pp 27-28

ABSTRACT: It was in 1972, when the 100m pipe was being laid at Wusong Water Plant of Shanghai , the subject of laying large caliber long pipes began to be studied, along with such problems as reducing the friction resistance, controlling the sifting sand, etc. In 1979, the State included it as one of the key items of scientific research. Most recently, the pipeline across Yongjiang was completed. It measures 580 m in length and 2.6 m in diameter, with a directional error allowance of not exceeding ± 3cm. The pipeline is laid about 16 m from the surface. Due to the effect of tides, the gound water head is as high as 14-16 m. The difficulties encountered, the tools used, and new techniques adopted are very briefly mentioned. There are photos, presumably depicting the pipe but the caption says only: "Scientific technique is productivity."

6168
CSO: 4009/449

AUTHOR: WANG Aihang [3769 1947 3100]
CHEN Weizu [7115 1983 4371]

ORG: Both of Yichun Engineering Machinery Plant and Tianjin Research Institute of Engineering Machinery

TITLE: "ZL20 Loader"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY] in Chinese No 6, 81 pp 1-5

ABSTRACT: The loader jointly made by Yichun Engineering Machinery Plant and Tianjin Research Institute of Engineering Machinery has just been certified by the State for production in batches. This paper introduces its applications, including shoveling loose materials, such as coal, sand, stones, etc., transporting it, or loading it on trucks, and below grade II soil excavation work. It is a multi-purpose construction machinery. Its major parameters and structure are described and illustrated with numerous drawings. A photo of the loader is on the front cover of this issue of the journal.

AUTHOR: LIU Zhisen [4151 1807 2773]
HUANG Caizhen [7806 1752 6297]
YU Guoyuan [0060 0948 1254]

ORG: LIU, HUANG of Foundation Research Center, China Academy of Construction Science; YU of Beijing Municipal Research Institute of Construction Engineering

TITLE: " BQZ Hydraulic Walking Type All Screw Drilling Machine"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY] in Chinese No 6, 81 pp 5-8

ABSTRACT: The BQZ hydraulic walking type all screw drilling machine was made by Beijing Municipal Research Institute of Construction Engineering in 1977, on the foundation of the QZ_4 automobile style all screw drilling machine. It was a joint design of the institute, the Foundation Research Center, and other organizations, and was manufactured by Hebei Province Xinhe Drilling Machine Plant. In Oct 79, it was certified by the State and deemed to have the characteristics of being simply constructed, stable, capable of walking nimbly and aiming accurately, etc. It is now being produced in batches. The paper contains descriptions of its major technical parameters, its structure, and its application properties.

AUTHOR: DAI Zhenqian [2071 2182 0051]

ORG: Machine Tool Station, Division No 1, Jiangsu Provincial Electrical Power Construction Company

TITLE: "Portal Jib of the Lift Type Crane"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY] in Chinese No 6, 81 pp 8-10

ABSTRACT: The cranes dealt with in this paper include the caterpillar tread type and the wheel type guy derricks with a swinging arm. The portal jib is in the rear of the rotary platform, composed of a triangular frame on each side and a horizontal axle. A pulley is installed on the horizontal axle and a steel cable reel on the pulley to regulate the length and dip of the swinging arm. On the cranes extensively in use in China, the Q_{51} truck crane, the QL3-16 tire crane, the W501, the W1-06, the W1001, the Z801 (the Soviet Union,) the KU1206 (Poland,) the Z1252 (the Soviet Union) makes of caterpillar tread cranes, the height of the portal jib is all at 3.4-4.18m. For the convenience of transportation, the jib must not be higher than 4m. The jib of the 50 ton capacity caterpillar crane W2001 is 6.3m in height and must be taken down before the crane is moved. The structure, the function, the load capacity, and other parameters of portal jibs of various sizes are discussed.

AUTHOR: DING Yulan [0002 3768 5695]

ORG: Department of Mechanical Engineering, Tongji University

TITLE: "An Important Research Subject in Engineering Machinery, the Noise of Machines"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY] in Chinese No 6, 81 pp 52-54

ABSTRACT: When engineering machinery is at work, the damages to the environment include noise, vibration, and exhaust pollution. This paper discusses only the problem of noise. The term noise includes sound and an irregular combination of it of various different frequencies. From the viewpoint of physiology, any sound that is annoying to humans is called a noise. Noise can reduce work efficiency and quality, increase the frequency of errors and accidents, and can even affect the health of the people, the normal operation of instruments and equipment, or damage building structures. This paper introduces medical and scientific data with respect to the harmfulness of noise, and conditions of foreign and domestic efforts in controlling noises caused by the operation of various machines.

6168
CSO: 4009/433

AUTHOR: XIONG Mingguang [3574 2494 0342]
YAN Hongfan [0917 3163 5400]

ORG: Both of Shanghai Research Institute of Computer Science

TITLE: "Applications of Electronic Computers in Shanghai"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 7, 20 Jul 81 pp 1-4

ABSTRACT: If the hardware system of computers may be said to be established on the basis of electronics, then the software system is on the basis of mathematics. From computations, applications of computers have been extended to management of economic activities, real time data processing, procedure control, etc. in a worldwide ratio of 3:7 or 2:8 favoring the latter forms, yet these applications are built on the foundation of mathematical description of events and solutions of mathematical problems. This paper discusses the relationship between mathematics and the new applications of computers in structural designing, stress analysis, designing of ships, railways, and highways, calculation of dynamic models, statistical analyses and simulation, processing graphics, production procedure control, artificial intelligence systems, etc. more in general terms than specifically in Shanghai, however. A few plants, such as Shanghai Yingxiong Pen Factory, Shanghai Wool Sweater Plant No 8, Shanghai Radio Plant No 20, Shanghai Steel Mill No 5, Shanghai Oil Refinery are briefly mentioned to be users of computers, without referring to details.

AUTHOR: HE Zhibin [0149 6347 1755]

ORG: None

TITLE: "Importance of Quality Control of Electronic Parts Considered in View of Spaceflight Technology"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 7, 20 Jul 81 pp 22-24

ABSTRACT: Since the first artificial satellite was launched in 1957, by Aug 79, a total of 2378 space vehicles had been sent off by various countries of the world. The history of spaceflight technology has not been very long in China. Statistically speaking, the rate of success in 1976 was about 78 percent. Among the ventures that failed, malfunction of the key system is the cause of 55 percent of these, and 30 percent of the malfunctioned systems are the results of failures of electronic components. Artificial satellites require the electronic components to be highly reliable as well as to be adaptable to their special environments. The rate of losing effectiveness should be 10^{-7}/hour to 10^{-9}/hour; the radiation resistance 10^4 to 10^7 rad (silicon); the vaccum pressure 10^{-9} to 10^{-12} millimeter of mercury. Quality inspection, evaluation, and the limitations in quality control of electronic components are briefly discussed in terms of these high requirements.

6168
CSO: 4009/445

AUTHOR: XUE Ruiliang [5641 3843 2733]

ORG: East China Bureau of Management of Electrical Power

TITLE: "Power Stoppage Over an Extensive Area"

SOURCE: Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 7, 81 p 22

ABSTRACT: On 27 Jul 80, with a big bang, the voltage mutual inductor (JCC 2-220) of a certain transformer substation in Anhui Province blew up. Flame, pieces of ceramics, and ramnants of other equipment were flying all over the place. The vibration ran through the entire power system of the province. In less than one hour, the power supply of 2 cities and 7 districts of central and southern Anhui stopped. The loss to industrial production was valued at more than two million. Subsequent analysis determined the cause to be mainly an inferior seal at the top of the voltage mutual inductor to cause it to become damp. Additionally, the internal insulation was poor so that the main insulation was blown through. Several such accidents had occurred in the East China Power Network. The seal is a very small item but it is the key to this piece of equipment. The paper suggests that a nitrogen or oil filled plastic sack should be placed on the top of the mutual inductor, with a piece of iron plate on top of the sack to form a small positive pressure inside the inductor to stop moisture or water from entering it. This method can also delay the deterioration of the lubricant.

AUTHOR: XUE Ruiliang [5641 3843 2733]

ORG: East China Bureau of Management of Electrical Power

TITLE: "Close to One Hundred Persons Were Poisoned"

SOURCE: Shanghai DIANSHIJIE [ELECTRICAL WORLD] in Chinese No 7, 81 p 22

ABSTRACT: On 25 Jul 80, poisonous gas leaked out of a certain chemical plant in Shanghai and close to one hundred inhabitants were poisoned. The culprit of this catastrophe was the current mutual inductor (LCLWD3-220) of a certain transformer substation of Shanghai to cause 2 large capacity 220kw transformers to trip and the power supply of that chemical plant to stop. As a result, the chlorine pressure in the electrolysis tank rose and the chlorine gas spilled out to poison a large number of nearby residents. Investigation verified the fact that there were air bubbles inside the core insulation of the condenser in that mutual inductor. Many similar incidents had occurred before. The author suggests that condenser type current mutual inductors should be ultra-high vacuum treated to remove all air bubbles that may have been left by improper oil filling work.

6168
CSO: 4009/450

AUTHOR: YUAN Ruilin [5913 3843 2651]
HE Laijing [6320 3200 1987]
HOU Xiangzhi [0186 4382 4249]
ZHANG Guangyun [1728 1639 0061]
XIAO Houjue [5135 0683 6030]
CHEN Jintian [7115 6930 3240]

ORG: YUAN, HE and HOU all of Taiyuan Institute of Technology; ZHANG, XIAO and CHEN all of Guangzhou Electronic Technical Institute, Chinese Academy of Sciences

TITLE: "Investigation and Manufacture of a V-type All-sliding Cubic Anvil Super High Pressure Apparatus"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 1-16

TEXT OF ENGLISH ABSTRACT: In this paper, the theoretical analysis and experimental research of a v-type all-sliding cubic anvil super high pressure apparatus are stated. The main factors of influence on compression accuracy are explained. The authors also suggest the calculating method of determining the optimal constructional parameters, and measure the increasing lifetime of the apparatus under continuously operation conditions so as to put it into industrial production from the experimental operation stage.

AUTHOR: ZHOU Rengen [0719 0088 2704]

ORG: Taiyuan Institute of Technology

TITLE: "An Elementary Exploration of Dynamic Programming Algorithm"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 17-26

TEXT OF ENGLISH ABSTRACT: In this paper four kinds of algorithms in which the state variables in the Bellman function of dynamic programming take the forms of discrete values are studied. By making use of these different approaches of the algorithms based on the different laws of the variation of decision function $d[s, X_n (s)]$ and maximum return function $f_{n-1}[X_n (s)]$, the amount of calculation work is reduced and the effect of the n-stage being optimal is ensured. In addition, a practical example for calculation is presented and the features of the above-mentioned algorithm are described.

AUTHOR: FAN Fengxi [5400 6646 2569]
SHANG Keqin [1424 0344 0530]

ORG: Both of Taiyuan Institute of Technology

TITLE: "The Analysis of List Sorting Algorithms"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 27-35

TEXT OF ENGLISH ABSTRACT: Of sorting methods both algorithms of list sorting are described in this paper, i.e., list insertion algorithm, list merge algorithm and their programs. According to the three principles of evaluating sorting algorithms, they are analyzed and compared. In the paper the methods of computation are abstracted and some tables are given to evaluate their sorting effect intuitively.

AUTHOR: LING Daqi [5677 1129 3823]
WANG Zhizhong [3769 1807 1813]

ORG: Both of Taiyuan Institute of Technology

TITLE: "Theoretical Calculation of Liquefaction Efficiency Based on Various Kinds of Coal in China"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 36-43

TEXT OF ENGLISH ABSTRACT: In this paper a thermodynamic method has been used to calculate the efficiency of coal liquefaction based on various kinds of coal. It is assumed that a hydrogen source (both enthalpy and hydrogen) is provided from the same kind of coal when it is converted into transportable fuel. The results from calculation for most kinds of coal indicate that in order to upgrade coal to fuel of $H/C = 1.6 \sim 2.2$, the actual fraction of coal used for liquefaction is about $60 \sim 75$ percent. According to the International Classification of Hard Coal, coal classes 4, 5, 6 and 7 have higher liquefaction efficiency, but the lignite containing much more oxygen gives a poor percentage efficiency.

AUTHOR: GAO Mingyuan [7559 2494 6678]

ORG: Taiyuan Institute of Technology

TITLE: "The Calculating Method of Indoor Non-sanitary Fixtures for One or More Closed Circuit Water Supply Pipe Systems"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 44-56

TEXT OF ENGLISH ABSTRACT: This article is to offer the hydraulic calculation method of indoor non-sanitary fixtures for one horizontal and one or more vertical closed circuit water supply pipe systems through examples. The common characteristic features of this method deal with the working conditions of the designed maximum discharge of the closed circuit and with determining the pipe diameters and water head.

AUTHOR: CUI Yuchuan [1508 3768 1557]

ORG: Taiyuan Institute of Technology

TITLE: "The Analysis of the Relation between the Siphonic Filter's Depth and Its Design Rate of Filtration"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 57-66

TEXT OF ENGLISH ABSTRACT: This paper discusses the design depth (the maximum water head of filtration), the checking purpose, content and method of the siphonic filters through the analysis of the relation between the siphonic filter's depth and its rate of filtration, and an explanation of a few kinds of rates of filtration and a discussion of the selection of the design rate of filtration are also included. In addition, it demonstrates the inner links of the current experimental data or parameters, such as the filter's design rate, the washing head, the maximum filtrating head, etc.

AUTHOR: TU Shuji [3205 2885 1015]

ORG: Taiyuan Institute of Technology

TITLE: "A Mechanical Method of Adjusting Trilateral Nets with Central Figures"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 67-81

TEXT OF ENGLISH ABSTRACT: In this paper the mechanical method has been introduced for the adjustment of trilateral nets with central figures. This method is based on the principle of minimum work in mechanics, and the result of adjustment has exactly the same value as is obtained by calculations from the least squares method. It offers a direct and simple solution and shows the advantage of using this method for adjusting trilateral nets.

A complete numerical example has been provided in this paper from which the adjusted value of sides, coordinates and positional accuracy of points can be directly obtained.

AUTHOR: ZHANG Hengxin [1728 1854 2450]

ORG: Taiyuan Institute of Technology

TITLE: "The Distribution of the Curvature Center of Circular-arc-gears"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 82-89

TEXT OF ENGLISH ABSTRACT: As the distribution of the curvature center of circular-arc-gears has a bearing on wearability, movement property, engagement parameters and other factors, in this article various distribution schemes according to the tooth wear, gear vibration noise, strength, etc., are analyzed and compared. Reasonable distribution schemes with gears on the parallel axis drives are thus obtained.

AUTHOR: LI Yuanzong [2621 0037 1350]

ORG: Taiyuan Institute of Technology

TITLE: "Analysis and Calculation of Motion States of Industrial Robots"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 90-111

TEXT OF ENGLISH ABSTRACT: An analysis and calculation method of motion states of industrial robots is described in this paper by transformation of coordinate systems. The author presents in detail a relationship between the elements in the transformation matrix and the parametric variables of motion, builds a set of fundamental equations of motion variables, and derives a group of simple formulas for the inverse matrix of the transformation matrix. A parallel shaft mechanism which may be resolved is also introduced and the motion parameters for two types of industrial robot devices are calculated with practical examples. This method is a practical tool both for developing the industrial robot mechanism and for realizing the automation of complex machines.

AUTHOR: WANG Shengkun [3769 0524 0981]

ORG: Taiyuan Institute of Technology

TITLE: "An Approach to Some Important Properties of Analytic Signals"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 112-117

TEXT OF ENGLISH ABSTRACT: In this paper some important properties of analytic signals are approached. The conclusion we have arrived at is not at all similar to the traditional one that has been used for years. In this paper we suggest that the convolution of one analytic signal and the complex conjugation of another one, as well as their correlative integration, should not be equal to zero unconditionally. In general cases they should be constants which are not equal to zero, but are equal to the product of zero-frequency values of two analytic signals.

AUTHOR: XU Wenyang [1776 2429 2543]
GUO Changjie [6753 1603 2212]

ORG: Taiyuan Institute of Technology

TITLE: "The Theory of Volume Filling for Microporous Adsorbents"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 118-126

TEXT OF ENGLISH ABSTRACT: The development of the theory of volume filling for micropores adsorption of gases and vapors is summarized in this paper.

9717
CSO: 4009/366

AUTHOR: MEI Houjun
et al.

ORG: None

TITLE: "Ophiolite Series in Qinghai-Tibet Plateau and Genesis of the Ophiolite in Western Tibet"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 107-113

TEXT OF ENGLISH ABSTRACT: Several ophiolite belts and an ophiolite assemblage have been discovered in the Ali region and the Upper Valley of the Yarlung Zangbo River. As is shown by alkalisilicon and titanium-zirconium diagrams of volcanic rocks from these ophiolite belts, most of the volcanic rocks in these regions may not have been produced from the ocean floor. Cretaceous volcanism in western Tibet bears a strong resemblance to that of the present day Pacific Arc. Based on a review of ophiolite distribution on a worldwide scale, the authors suggest classifying the four major orogenic regions into four "ophiolite series," i.e., the Qinghai-Tibet, the Altay, the Alpine and the Circum-Pacific ophiolite series. Among other things, all the blocks, large and small, in the crust seem to be forced to converge respectively at the four places as a result of continental drift during the last billion years.

AUTHOR: RAN Chongying [0373 1504 5391]

ORG: Kunming Engineering Institute

TITLE: "On the Sedimentary Environment and Diagenetic-Metallogenesis of Dongchuan Type Stratiform Copper Deposit in the Kangdian Earth's Axis"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 114-119

TEXT OF ENGLISH ABSTRACT: In the present paper it is suggested that the bay or lagoon areas of the post-reef of stromatolith and the bathyal areas of pre-reef were water basins where copper ores were deposited, the former corresponding to syngenetic dolomite facies of post-reef bay or lagoon environment and the latter to black shale-dolomite facies of pre-reef building. It is concluded that the stratiform copper deposits are genetically of diagenesis and closely related to stromatolith reef, but not directly to the tuff in sedimentary origin.

AUTHOR: ZHANG Rubo [1728 1172 2672]
GONG Xiasheng [7895 1115 3932]
ZHOU Zhendong [0719 2182 0392]
et al.

ORG: All of Chengdu Geological Institute

TITLE: "Muchuanite, A New Water-bearing Molybdenum Sulfide Mineral"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 120-127

TEXT OF ENGLISH ABSTRACT: Muchuanite, a new water-bearing molybdenum sulfide mineral, was discovered in a series of molybdenum-bearing feldspathic quartz-sandstone of the Jurassic system, Sichuan Province, China.

Muchuanite is dark, powdery and very finely scaled with specific gravity of 5.01 (meas) and 5.10 (calc), and microhardness of 16-35 kg/mm^2. Optically, it is uniaxial (-). Refractive index in air R_g = 26.6 - 29.5 percent, R_p = 12.3 - 14.2 percent, color index X = 0.3114, Y = 0.3748, λ_d = 566 mμ, and Pe = 14.4 percent.

The chemical composition of muchuanite is given as follows: Mo 52.88, 54.20; S 37.34, 36.00; Fe n.d., 2.2; Si n.d., 0.5; H_2O^+ 6.03, 5.95; H_2O^- 2.07, 1.00; total 98.59, 99.85. Chemical and electron microprobe analyses gave the following formula: MoS_2 0.5 H_2O.

[Continuation of DIQIU HUAXUE No 2, 1981 pp 120-127]

Muchuanite is trigonal with space group C^1_{3v} = P3ml, unit-cell parameters a = 3.16 Å, c = 43.60 Å, v = 377.09 Å, z = 7, and a unit-cell contains 3.5 water molecules.

The strongest lines given by X-ray diffraction pattern (d, Å, intensity hkl) are 6.013 (10, 0. 0.7); 2.677 (8, 0. 0.16); 2.257 (7, 0. 0.19); 1.567 (7, 1. 1.3); 1.523 (7, 0. 0.28); 1.096 (3, 1. 1.28); 1.021 (3, 0. 0.42).

Muchuanite is syngenetic with feldspathic quartz sandstone. The mineral is named after the locality where it was discovered, i.e., Muchuan County in Sichuan Province.

AUTHOR: CHEN Yuwei
et al.

ORG: None

TITLE: "A Discussion of Zircon U-Pb Dating of Intermediate Acid Rocks in Southern Xizang"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 128-135

TEXT OF ENGLISH ABSTRACT: U-Pb isotopic geological ages were determined on more than 30 specimens of zircon, feldspar, sphene and apatite from the Kangdese rock belt and its eastern Bome-Zayu areas in Xizang (Tibet). The study of common lead derivation and its mode of occurrence in zircon indicates that large amounts of common lead occur as sulfide-facies minerals or exist in the crystal lattice of zircon, rather than being introduced by contamination during analytical procedure. Described in this paper is the validity of subtracting zircon-containing common lead from the isotopic components of syngenetic galena, consequently leading to the conclusion that intermediate-acid rocks in the studied region are brought forth by Late Yenshanian (120-80 m.y.) movement. It is suggested from the quantity of common lead and the difference in lead isotopic composition that the western segment of the Kangdese belt and its eastern Bome-Zayu areas may have two different material sources.

AUTHOR: ZHANG Yuquan
et al.

ORG: None

TITLE: "On the Crustal Movement Characteristic of the Xizang Plateau with Special Reference to Intermediate-Acid Magmatic Activities"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 136-141

TEXT OF ENGLISH ABSTRACT: In view of their distinct NWW trending and their decreasing geological age from north to south, intermediate-acid magmatic rocks in the southern part of Xizang can be divided into three petrographical belts in general: (1) the Kangdese belt (120-10 m.y.). The major part of the belt is mainly composed of diorite, granodiorite, etc., more intermediate in chemical composition and ranging from 120-70 m.y. in age; (2) the Lhangoi Kangri belt (30 m.y.); and (3) the Himalaya belt (20-10 m.y.). From their intruding features, spacial-temporal consistency, intruding scale, petrological characteristics and chemical composition, it is suggested that these three petrographical belts seem to be closely related to plate underthrust and collision.

It may be concluded that the major part of the Kangdese belt resulted from the underthrust of the Indian Ocean Plate toward the Eurasian Continental Plate, while the Lhagoi Kangri belt and Himalaya belt are the results of collision of the Indian sub-continental plate overlying the Indian Plate with the Eurasian Continental Plate.

AUTHOR: LIU Dongsheng
et al.

ORG: None

TITLE: "The Model of Environmental Quality for Yunnan Province and Keshan Disease"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 142-150

TEXT OF ENGLISH ABSTRACT: Discussed in this paper are the regularities governing the prevalence of Keshan disease and its relationship to the local rock type, soil, vegetation, climate and landform, as well as to the characteristic variations of stereo-environment--environmental gradient in Yunnan Province. Based on the foregoing discussion, the gradations of environmental quality and the coefficients of environmental quality mirroring the general picture of physical environment there have been determined, and a model of environmental quality has been established with an attempt to detail the relationship between the factors of environmental geology and Keshan disease.

AUTHOR: WEN Qizhong
et al.

ORG: None

TITLE: "A Preliminary Investigation of REE in Loess"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 151-157

TEXT OF ENGLISH ABSTRACT: REE oxides in loess are estimated to amount to about 200 ppm. The REE distribution patterns in loess and its clay fraction are characterized by the enrichment of rare earth elements of the Ce family.

The REE distribution patterns of loess in the middle Huanghe (Yellow River) Valley are consistent with those of sands from the Tengeli desert, probably indicating the consistency of their material sources. The REE distribution patterns are similar to each other in the clay fractions of Malan loess everywhere in the middle Huanghe Valley, indicating the homogeneity in their composition. Close to the average value of the earth's crust, the REE distribution patterns in loess and its clay fraction are similar to those of sedimentary rocks (e.g., North American shales), but different from those of chondrites. This seems to show that large amounts of loessic material were transported from the provenance by moving water into sedimentary systems after having been separated from its precursor, and then transported by wind to where it is now distributed.

AUTHOR: XU Guiquan [6079 2710 3123]
WU Weifang [0702 5898 5364]
LI Shi [2621 1102]
ZONG Puhe [1350 2528 0735]

ORG: XU, WU and LI all of the Institute of High Energy Physics, Chinese Academy of Sciences; ZONG of the Institute of Geochemistry, Chinese Academy of Sciences

TITLE: "Mossbauer Study of Apollo-17 Mare Basalt"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 158-161

TEXT OF ENGLISH ABSTRACT: The results of a Mössbauer study of Apollo-17 Mare basalt are reported in this paper. It has been revealed that Fe in iron-bearing minerals in the basalt is usually present in the form of Fe^{2+}, with Fe^{3+} less than 3 percent of total iron. The site occupancy of Fe^{2+} ions at M_1 and M_2 is approximately 0.3 and the corresponding equilibrium constant K (T) is about 0.06, thus indicating that the mare basalt is formed through crystallization under high-temperature reducing and rather slow cooling conditions.

AUTHOR: ZHANG Jinlai [1728 6855 0171]

ORG: Petroleum Geological Brigade No 101, Ministry of Geology

TITLE: "Some Hydrogeochemical Processes Related to the Formation of Terrestrial Oil Field Water in China"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 162-173

TEXT OF ENGLISH ABSTRACT: Terrestrial oil field water from the Upper Permian to Tertiary in China is characterized by great variation in its chemical composition. According to the first three predominant ions, oil field water can be classified into four categories, i.e., HCO_3-Cl-Na, Cl-HCO_3-Na, Cl-Na-Ca and Cl-SO_4-Na, which are referred to as categories A, B, C and D for simplicity.

From comparison of the features of oil field water with those of terrestrial evaporation water, in conjunction with available experimental results, five different hydrogeochemical mechanisms are suggested for oil field water evolution. They are: the evaporation and concentration, the biochemical process, enrichment of trace elements, diffusion of petroleum components and various exchange processes, including the exchange of cations, dolomitization, isotope exchange and the reverse exchange of anions. Chemical characteristics and some regularities concerning oil field water are interpreted in terms of these mechanisms.

AUTHOR: FENG Weiheng

ORG: None

TITLE: "Determination of Intrusive Relation between Two Rock Masses by Using Statistical Analysis of Regression Coefficients"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 174-180

TEXT OF ENGLISH ABSTRACT: Statistical analysis of regression coefficients is used to determine whether or not the two granites under investigation resulted from the same stage of magmatism. This method is especially powerful when the relationship remains ambiguous based on geological data. Encouraging results are also obtained by applying this method to the division of the mineralization stage as well as to the examination and revision of isotopic age data of igneous bodies.

AUTHOR: LIN Xuenong

ORG: None

TITLE: "Tectonic Compression Characteristic of the Ultrabasic Rocks in Dazuka Profile"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 181-184

TEXT OF ENGLISH ABSTRACT: The ultrabasic rocks of Dazuka form the eastern part of the Rinbung-Bainang ultramafic massif which is mainly composed of harzburgite intercalated with dunite, and high in MgO. This ultrabasic massif is assigned to magnesian ultramafic massif of Alpine type. In these ultrabasic rocks the major minerals are forsterite, enstatite, diopsite and chrome spinel. The rocks are very fresh and, therefore, texture and structure characteristics of compression during tectonic movement are commonly observed.

Undulatory extinction, polysynthetic twin, kink band structure, elongation and contortion of olivine and orthopyroxene crystals, radiating cracks occurring around the chrome spinels, etc., are commonly observed phenomena.

All these features show that the massif was under constant action of tectonic compression during its evolution process, and after it was basically consolidated. It is reasonable to consider that the tectonic compression was related to plate collision between the Indian and Eurasian plates.

AUTHOR: ZHANG Guangyu
et al.

ORG: None

TITLE: "Analysis Results of International Geochemical Reference Samples"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 185-188

TEXT OF ENGLISH ABSTRACT: The analytical procedures used for many years in our institute for rock analysis are tested against 18 international geochemical reference samples provided by CRPG, ANRT and USGS. The validity of our method and its suitability for widely different samples are substantiated by the good agreement between our results and the recommended values.

AUTHOR: WANG Shengyuan
et al.

ORG: None

TITLE: "Temperature Gradient in Cold-seal Pressure Vessels"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 189-196

TEXT OF ENGLISH ABSTRACT: Temperature gradient curves are given for 0.5 - 2 kbar and 300-600°C based on internal temperature measurements, and an empirical formula

$$t_x = T + (a_0 + a_1T + a_2T^2 + a_3T^3 + a_4T^4 + a_5TP + a_6P)x$$

is established to calculate the temperature at any point, x, within the bomb. Uncertainty of 90 percent of estimates by using this formula is less than 5 degrees. In most instances, real pressure within the bomb is only 60 to 80 percent of the designed pressure as based on P-V-T relations due to the existence of temperature gradient. This large pressure departure can be reduced to less than 30 bars by using

$$\bar{t} = 11.6 + 0.8973T + (0.01 - 3.06 \cdot 10^{-5}T - 5.664 \cdot 10^{-8}T^2 + 8.8667 \cdot 10^{-11}T^3)(P - 1250)$$

on the assumption of uniform temperature within the vessel.

[Continuation of DIQIU HUAXUE No 2, 1981 pp 189-196]

All temperature-dependent properties, such as water fugacity, ionization constant, and the solubility of gas in fluid phase, will vary with this temperature gradient. On the other hand, because the pressure within the bomb stays uniform, there must be an opposite gradient with respect to water density. Therefore, variations will likewise be expected in all the properties which are a function of water density, such as the dielectric constant and activity coefficient. These variations may be important for the interpretation and understanding of some experimental results.

AUTHOR: ZHONG Honghai [6945 4767 3189]
HU Guohui [5170 0948 6540]
XU Hanqing [6079 3352 0615]
et al.

ORG: All of the Guangdong Institute of Analysis

TITLE: "Determination of Uranium in Minerals by Delayed Fission Neutron Method"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 197-202

TEXT OF ENGLISH ABSTRACT: A brief account is given of the principle of the delayed fission neutron method and the related equipment for the determination of uranium in minerals by this method. The whole experimental procedure was autoprogramatically controlled. The neutron flux was monitored and delayed fission neutrons were measured in a multiscale mode by a multichannel analyzer. The method has the advantages of relative simplicity, quick performance, high accuracy, non-destruction and low cost. Its standard deviation is ± 0.2 percent and sensitivity 388 n/μg U. The comparison shows that the results obtained by this method are in good agreement with those obtained by other methods. Finally, the problem of interference in measurement is also discussed.

AUTHOR: ZHAO Minguang [6392 2404 0342]

ORG: Research Group of Quantum Chemistry, Sichuan Teachers College

TITLE: "Point Group Symmetry Magnetic Interactions and Application to Ruby"

SOURCE: Beijing DIQIU HUAXUE [GEOCHIMICA] in Chinese No 2, 1981 pp 203-207

TEXT OF ENGLISH ABSTRACT: By utilizing the magnetic interactions possessing C_{3v} symmetry, the author deduced the general expressions for the g-factors, zero-field splitting and effective magnetic moment of the ground singlet orbital state in the d^3-complex. For the ruby ($Al_2O_3:Cr^{3+}$), the results are in good agreement with experiments: theoretical values: $g_{//} = 1.9835$, $g_{\perp} = 1.9876$; $2D = -0.373$ cm^{-1}; $\mu_{//} = 3.857\beta$, $\mu_{\perp} = 3.861\beta$; experimental values: $g_{//} = 1.9840 \pm 0.0006$, $g_{\perp} = 1.9867 + 0.0006$; $2D = -0.3831 \pm 0.0002$ cm^{-1}; $\mu = 3.8 - 3.9\beta$.

9717
CSO: 4009/398

Hydrogeology

AUTHOR: WANG Dachun [3769 1129 4783]
ZHANG Renquan [1728 0086 5425]

ORG: None

TITLE: "Evaluation of Confined Ground Water Resources in Porous Media and Their Relationship With Surface Subsidence"

SOURCE: Beijing SHUIWEN DIZHI GONGCHENG DIZHI [HYDROGEOLOGY AND ENGINEERING GEOLOGY] in Chinese No 3, 81 pp 1-3, 8

ABSTRACT: Since the middle 50's, for evaluation of ground water resources, China had been using the 4 classifications, introduced from the USSR, of natural dynamic reserve, regulating reserve, permanent reserve, and mining reserve. Problems began to appear as early as the 60's, mainly concerning the fact that the technique is very unsuitable for evaluating crevice, load bearing water. Just about the same time, the problem of surface subsidence began to be gradually discovered in China. These 2 problems are not identical, yet according to present studies, any occurrence of surface subsidence is related to the extraction of fluids, water, petroleum, natural gas, etc. In consideration of the background, this paper begins with reclassifying ground water into the 2 types of renewable and nonrenewable. The composition of crevice, load bearing aquifer system or confined ground water resources is analyzed. When mining of nonrenewable aquifer has caused the water table to recede and funnels to form, permanent ground surface subsidence will occur following a reduction of the water pressure. Some surface subsidence data of Shanghai of China and California of the USA are included in the discussion.

AUTHOR: LIN Mujin [2651 2606 6855]
YE Heliang [0673 0735 5328]
LI Weicai [2621 4850 2088]

ORG: All of The 517 Team, North China Metallurgy and Prospecting Company

TITLE: "Understandings From Hydrogeological Prospecting of the Xishimen Iron Deposit"

SOURCE: Beijing SHUIWEN DIZHI GONGCHENG DIZHI [HYDROGEOLOGY AND ENGINEERING GEOLOGY] in Chinese No 3, 81 pp 9-13, 57

ABSTRACT: Xishimen iron deposit belongs to a typical crevice karst type mineral region with a complex hydrogeological condition. The deposit is located in the west side of Wuan basin, with the terrain higher in the west and lower in the north in a region of low mountains and hills of limestone and igneous rocks. A seasonal stream, Mahe, flows across the middle and the river bed has piles of sandy gravel, several to ten plus meters in height. The mean annual precipitation is 560 mm, concentrated mostly in Jul and Aug. The difficulty in the hydrogeological prospecting work is mainly in estimating the quantity of surge of water. In the beginning (1959) 4 small holes were drilled to pump water from each to obtain the infiltration coefficient of 0.495, 1.00, 2.96, 4.10 m/day. On this basis, the surge was estimated and later it was discovered to be more than 10 times higher than the estimate. In 1966, in connection with regional geological and hydrogeological investigation, 45 large holes were drilled, in addition to many extensive observations. The complicated process of learning is described.

AUTHOR: ZHENG Keyan [6774 0344 8568]

ORG: None

TITLE: "Comprehensive Utilization of Geothermal Resources of Beijing"

SOURCE: Beijing SHUIWEN DIZHI GONGCHENG DIZHI [HYDROGEOLOGY AND ENGINEERING GEOLOGY] in Chinese No 3, 81 inside from cover

ABSTRACT: The underground hot water in the Beijing region belongs basically to medium-low warm type temperature water, but practice of its utilization of many years has proved that it is extensively useful. In the process of mining, attention should be given to the problem of evaluation and recharge experiment must also be carried out beforehand. The fluorine content of the geothermal water is rather high and corrosion prevention studies should also be emphasized. Contents of radium, iron, and radon , etc. of the water of some places far exceed the standard for drinking water; therefore, timely consideration of the pollution effects of prolonged discharge of this hot water is also extremely import and attention should be given to its prevention and control. The paper also includes 6 photos depicting (1) Using geothermal water to wash and dye cloth (Guanghua Dyeing and Weaving Plant); (2) Geothermal Bath (People's Machine Plant); (3) Hot water therapy (Xiaotangshan Sanitarium); (4) Hot water for industrialized fish culture (Changping Marine Products Breeding Farm); (5) Geothermal greenhouse (Yaowa Production Team); (6) Geothermal earthquake observation (Jingmian [Beijing Cotton] Mill No 3.)

6248
CSO: 4009/446

AUTHOR: GU Zengdi [7357 2582 6611]

ORG: None

TITLE: "Tungsten Electrode Manual Argon Arc Welding of Titanium and Titanium Alloys"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 7, 81 pp 14-16

ABSTRACT: Titanium and titanium alloys have good corrosion resistant property, low specific gravity, and high strength. They also have some heat resistance and machining capability. Due to these physical, chemical, and heat treatment properties, they are being more and more extensively used in airplanes, rockets, missiles, space vehicles, chemical engineering machines, oil refinery equipment, sea water desalinization equipment, medical instruments, meters, etc. and for the same reasons special welding technique is required for joints of this material. Melt electrode automatic argon arc welding is used for plates larger than 10mm; vacuum argon welding for articles of complicated shapes. For plates smaller than 10mm the most extensively adopted technique is the tungsten electrode manual argon arc welding technique. Specifications of materials for which this technique is suitable are given in a table. Preparations before welding and the welding procedure are described.

AUTHOR: None

ORG: None

TITLE: "Collected Papers of 1980 Annual Conference of Shanghai Municipal Mechanical Engineering Society to be Published"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 7, 81 p 46

ABSTRACT: In 1980, several scientific discussion meetings concerning the improvement of product quality and conserving energy resources were held by the Shanghai Municipal Mechanical Engineering Society. Papers, 46 of them, submitted to these meetings, have been selected for publication; 14 of these papers are judged to be superior and are to be published unabridged. The remaining 32 papers are to be published in abstracts. In order to calculate the number of copies needed, organizations and individuals are here requested to write to the Shanghai Municipal Mechanical Engineering Society (47 Nanchang Road, Shanghai) to declare the number of copies they want. The society will reply by mail when the date of publication is certain. There will be a charge to cover the cost of publication.

6248
CSO: 4009/447

AUTHOR: CHEN Tiequn [7115 6993 5028]

ORG: Wuhan College of Engineering

TITLE: "Effects of Soft Nitridation on the Abrasion Resistance of Steel"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 6, 81 pp 1-6

ABSTRACT: This paper discusses and evaluates various soft nitriding treatments of steel and their effects on resistance to abrasion by hard fretting, scuffing, or rubbing and on corrosion resistance. Under given conditions, nitriding treatments are compared with results of other methods of treatment. With regard to occasions with different abrasive mechanism as the leading action, the test results reported in this paper may serve as the experimental data of practical significance for the selection of a relatively more reasonable technique of surface treatment for steel.

AUTHOR: CHEN Longgao [7115 7127 7559]

ORG: Beijing Automobile Manufacturing Plant

TITLE: "Solid Solution-Time Effect Hardening of HPb59-1 Brass"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 6, 81 pp 29-31

ABSTRACT: Several automobile parts of the Beijing Automobile Manufacturing Plant are made of HPb59-1 lead brass and are formed through hot forging. When the parts are assembled, cracks and disengaged threads are regularly discovered and these parts must be discarded. For the purpose of finding the reasons of this problem, some experiments are carried out. Through metallic phase and hardness inspections, the α-phase (white colored) is discovered to be distributed, in the form of large net-like stripes or lumps, on the β-phase (black colored,) being a typical overheating situation, but the hardness is very low, only HRB40-45. The hardness of the undamaged parts is all above HRB70. It is the conclusion of the studies that during the forging process, the temperature is excessively high while the pieces are also slowly cooling off to cuase the crystalline grains to be rough and large and to deteriorate. The solid solution-time effect hardening technique is recommended as a remedy, with 750-760°C heating, water cooling, and one hour time-effect at 350°C.

AUTHOR: DENG Dongchang [6772 2639 2545]

ORG: None

TITLE: "Heat Treatment to Strengthen QA19-4 Aluminum Iron Bronze"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 6, 81 pp 35-42

ABSTRACT: Unlike aluminum alloys, beryllium bronze, and other colored metals, the QA19-4 aluminum iron bronze depends mainly upon quenching to obtain the β' phase of the martensite type to improve its strength. This paper introduces the heat treatment procedure and its relationship to the β' phase in the hope of finding a relatively ideal heat treatment process for this alloy. Some suggestions are included concerning the aluminum content of QA19-4 aluminum iron bronze corresponding to the YB 458-71 standard.

6168
CSO: 4009/434

AUTHOR: ZHANG Ziyuan [4545 1311 0337]

ORG: Beijing College of Aviation

TITLE: "Hydrochloric Acid Catalytic Nitriding Technique"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 7, 81 pp 1-8

ABSTRACT: This paper reports an experiment with the direct use of hydrochloric gas as the catalytic nitriding agent. The mechanism of the nitriding action of the gaseous hydrogen chloride is analyzed. Through routine gaseous nitridation, techniques of electrolytic gaseous catalytic infiltration nitridation, hydrochloric acid catalytic infiltration nitridation, and air-added hydrochloric acid catalytic infiltration nitridation are compared. Results demonstrate that the nitriding depth, hardness, and brittleness of these techniques are similar to results of routine nitridation in terms of carbon steel, alloy steel, and stainless steel, with the white layer slightly thicker and the hardness slightly higher. The speed of infiltration of the hydrochloric acid catalytic nitriding method is faster than the routine method, while the nitriding result is the same as the electrolytic gaseous method and the danger of explosion of the sealed electrolytic tank may be avoided.

AUTHOR: ZHANG Furui [1728 4395 3843]

ORG: Dalian Motor Vehicle Plant

TITLE: "Experimental Research on Medium Carbon Steel Laser and Electron Beam Surface Quenching Technique"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 7, 81 pp 20-25

ABSTRACT: Laser and electron beam surface quenching are techniques of veryfast heating and self-cooling method of quenching the metal surface with high energy density particle beam. Many countries are studying it and a few countries are applying it in production. In consideration of some quality problems with 45 steel and 42CrMo steel, the author and colleagues experimented with these advanced techniques. Results indicate that the surface quenching effects on 42CrMo steel vary as the size of the electron beam is adjusted; as the power of the electron beam increases, the hardness, the width of the quenching zone, and the depth of the quenching layer also increase. With the laser surface quenching technique, it appears to be necessary to proceed with "melanizing treatment" of the surface of the metal parts first. The electron beam method should be applied in a vacuum chamber. They are both more complicated than other surface treatment techniques, but neither require a spray cooling medium.

6168
CSO: 4009/448

AUTHOR: None

ORG: The Collaborating Group for the Prevention and Treatment of Dengue Fever, Foshan, Guangdong

TITLE: "Etiologic and Serologic Investigation During an Epidemic of Dengue Fever in Foshan District of Guangdong Province in 1978"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, 1981 pp 239-246

TEXT OF ENGLISH ABSTRACT: During the summer and autumn of 1978, an epidemic of dengue fever occurred in Foshan District. From blood specimens taken during the acute stage of certain patients with clinical manifestations, three strains of dengue virus type IV were isolated. Through a study of 180 acute-convalescent paired sera and a survey of 109 single blood samples of convalescent patients, it has been found that the causative agent was also evaluated to be the same type of dengue virus. By an investigation of the antibody level of the normal population of this area, both during pre-epidemic and epidemic periods, it was found that the antibody titer of 1:32 or lower in a single specimen of suspected dengue fever may be of diagnostic value. It has also been observed that the complement fixation titer began to rise within a week after the beginning of the disease, and the peak titer was reached by the third week, eventually dropping to 1:64 or lower at the

[Continuation of WEISHENGWU XUEBAO No 2, 1981 pp 239-246]

third month. For the complement fixation test, the antigen prepared from brain suspension of infected mice should first be treated with freezing and thawing three times, and finally extracted by a sucrose-acetone mixture to reduce the non-specific reaction of the crude antigen.

AUTHOR: HUANG Yongcheng [7806 3057 2052]
CAO Yousong [2580 0645 2646]
CAO Yiming [2580 0001 7686]
et al.

ORG: All of the Changchun Serum and Vaccine Institute, Changchun

TITLE: "Studies of Attenuated Tick-borne Encephalitis Vaccine. I. Selection of Attenuated Strain"

SOURCE: Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese No 2, 1981 pp 247-256

TEXT OF ENGLISH ABSTRACT: In order to increase peripheral multiplication and enhance immunogenicity, the suckling mouse variant "Sof" was subpassaged continuously in mice, guinea pigs and gold hamsters. After passage, attenuated variants selected showed very low degrees of neurotropism. By an intracerebral route of inoculation, it was incapable of causing disease or death in either the hamster or M. rhesus, and its pathological changes in the brain were nearly negligible. This variant retained its intracerebral pathogenicity in the mouse and was antigenically similar to the original line. It was thus concluded that this strain of virulence is more attenuated for the mouse as are other reported strains.

The immunogenicity of variant "HS6" strain was tested in 171 volunteers without prior TBE virus experience or history of allergic state, by the subcutaneous

[Continuation of WEISHENGWU XUEBAO No 2, 1981 pp 247-256]

route of one dose. No local or generalized reaction was observed. The sera were assayed for specific virus neutralizing antibodies against the TBE virus strains "Chang" and "Sof," and the sero-conversion rate appeared to be 38-60 percent.

9717
CSO: 4009/384

Oceanology

AUTHOR: ZHU Jimao [2612 4949 2021]

ORG: Shanghai Jiaotong University

TITLE: "Analysis of Special Considerations in the Design of Submersibles"

SOURCE: Beijing HAIYANG XUEBAO [ACTA OCEANOLOGICA SINICA] in Chinese Vol 3 No 2, Jun 81 pp 307-329

TEXT OF ENGLISH ABSTRACT: As the submersible is widely different from ordinary submarines in both its purpose and its working conditions, special requirements must be met in hull construction, operation control, equipment and communication and navigation systems. Because its energy source is limited, the cruising range of the submersible is very small and it has to be carried by other vehicles. Consequently, strict displacement requirements must also be met. Therefore, the principle of design and method of analysis of the submersible are greatly different from those of ordinary submarines. Based on experience in the design of the submersible and some related research work, the author analyzed special considerations in the design of the submersible, starting with the weight equation and the equation of motion, and obtained the following conclusions:
1. In order to reduce the displacement of the shallow water submersible, a big pressure hull should be designed so as to use as little buoyancy material as possible, since the relative proportion (γ_c) of the pressure hull of the submersible in shallow water is smaller than the relative proportion (γ_b) of the buoyancy material. As for the submersible in deep water with γ_c greater than γ_b,

[Continuation of HAIYANG XUEBAO Vol 3 No 2, Jun 81 pp 307-329]

a small pressure hull should be designed instead and equipment should be placed outside it.
2. Reduction of the relative proportion of the pressure hull has a great influence on the reduction of the displacement of the submersible. Within certain limits of relative depth, γ_c can be reduced when the material strength is raised and a ball-shaped pressure hull is used. But when the hull is to be used within limits of stable depth, raising the material strength has little influence on the reduction of γ_c and the ball-shaped pressure hull is not necessarily better than a cylindrical one. From the perspective of raising the actual safety factor, keeping close manufacturing tolerance is more effective than reducing the quantity of tolerance factors.
3. The specific gravity of seawater and the capacity of the submersible change with the temperature and salinity of the water and the diving depth of the submersible. According to data of the China coast, changes in these aspects can lead to a great change in buoyancy. The change in buoyancy can be resolved into dw_R (change in buoyancy due to the difference in sea areas) and dw_z (change in buoyancy due to the difference in depth of seawater). The former can be adjusted by submersible solid ballast and the latter by a buoyancy adjustment system in the submersible. The characteristics of the variation of buoyancy with the depth of seawater are determined by the relative magnitude of the changes in specific gravity and in capacity. When the specific gravity change is greater than the capacity change, the submersible is statically stable with respect to depth. When

[Continuation of HAIYANG XUEBAO Vol 3 No 2, Jun 81 pp 307-329]

the specific gravity change is smaller than the capacity change, the submersible is not statically stable with respect to depth. Different adjustment schemes must be used in each case respectively.

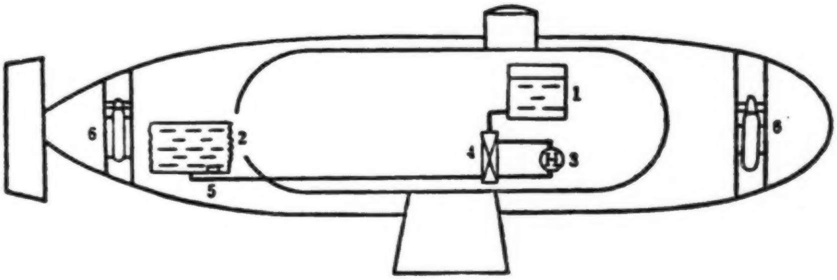


Figure 9. Diagram of Buoyancy Regulation System

Key:
1. Oil tank
2. Bag
3. Hydraulic pressure gauge
4. Electromagnetic valve
5. Spacing switch
6. Propeller

[Continuation of HAIYANG XUEBAO Vol 3 No 2, Jun 81 pp 307-329]

4. Calculation of the characteristics of the practical scheme of buoyancy adjustment and model test show that the linear buoyancy adjustment system is stable only when the rate of flow controlled by the velocity signal and acceleration signal is very high. The nonlinear adjustment system is stable when the rate of flow controlled by the velocity signal is much greater than that controlled by the depth signal. In order to avoid using highly sensitive velocity and acceleration transducers and proportion valves, the nonlinear depth adjustment scheme of additional vertical thrust can be adopted. Model tests show that a good matching can give fairly good results.

9717
CSO: 4009/396

AUTHOR: WU Kaisan [0702 7030 3790]

ORG: None

TITLE: "Cavern Anchor Blown Support Constructuction Technology"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 6, 81 pp 9-13

ABSTRACT: In the process of constructing anchor support for the top of a natural cave at a certain engineering project and the cavern of another engineering project, the technique of long distance blowing was adopted. The results were very satisfactory. A WG-25 jet sprayer and a HPX negative pressure jet sprayer were used, in addition to a forced concrete mixing machine. The material was blown to a maximum distance of 255m at a maximum drop of 35 m. Details of the anchoring and support structures, the spraying tools, the dust preventing measures, and various procedures of preparation are described. This technique appears to have basically resolved the problem of dust in this type of construction process, but continued study on better spraying machines and liquid solidifying agents are still needed.

AUTHOR: None

ORG: None

TITLE: "The First Electronic Computer Work of Railway Tunnels Experience Exchange Meeting"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 6, 81 p 23, inside front cover

ABSTRACT: The first electronic computer work of the railway tunnel specialty experience exchange meeting, sponsored by the Bureau of Tunnel Engineering of the Ministry of Railway and the Second Survey and Designing Academy was held 21-28 Apr 81 in Chengdu. Participants included 52 delegates of 17 organizations including the Bureau of Basic Construction, the Scientific Research Academy, the Southwest Scientific Research Institute, and the various designing academies of the Ministry of Railways, Jilin Bureau of Railway, Southwest Transportation University, North China Transportation University, Changsha Railway College , Shanghai Railway College, Shanghai Tunnel Research Institute, Chongqing Branch of the Ministry of Transportation Scientific Research Academy, Tongji University, et al. In recent years, electronic computer technology has been extensively popularized in the various units of the railway system. In some instances, it is combined with model experimentation and site surveying data to make the design closer to reality. In computation theory, the finite-element method is extensively applied, and from

[continuation of DIXIA GONGCHENG No 6, 81 pp 23, inside front cover]

linear analysis, the technique has expanded to nonlinear analysis, from the elastic theory, it has expanded to elastic plasticity theory. With the new developments in the extension and application of electronic computer technology, the need to develop computerized optimization designing, automatic graphics etc. is also discussed. Aspects of computer technology concerning program verification and management also form a part of the experience exchange.

6248
CSO: 4009/435

AUTHOR: HU Yuxian [5170 5124 6343]

ORG: None

TITLE: "Progress in the Technique of Underground Bomb Shelter Structure Designing Analysis in View of the 1974 USA Air Force Manual"

SOURCE: Chongqing DIXIE GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 7, 81 pp 4-10

ABSTRACT: In consideration of the advancement in nuclear weaponry and increased understanding of its effect on civil engineering structures since the publication of the USA Air Force Manual of Dec 1962, a research project was organized under the leadership of the Defense Atomic Support Agency of that country and the 1974 Air Force Manual was compiled by the Civil Nuclear Systems Corporation, with the Air Force Weapons Laboratory, the Air Force Systems Command, and the Kirtland Air Force Base participating. After comparing the contents of the 2 manuals very briefly, this paper proceeds to introduce the progress in underground blast resistant structural designing, based upon the new manual, in the 3 aspects of (1) Free field pressure attenuation; (2) Determination of structural load; (3) Analysis of structural designing. Although the new manual is much improved, considerations of many problems remain to be the one dimensional effect of wave propagation. Many two dimensional and three dimensional effect phenomena are not reflected. In the opinion of the author, a great deal of investigation and study are still needed to produce an even more complete and simple to follow manual for bomb protection structural design.

AUTHOR: TIAN Yujia [3944 5940 3946]

ORG: None

TITLE: "Comprehensive Discussion of the Condition of Model Experiment of Underground Structures, in China and Abroad"

SOURCE: Chongqing DIXIE GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 7, 81 pp 11-18

ABSTRACT: The major purpose of experiments with underground structural model made of a brittle material is to determine the distribution of stress of surrounding rocks and the phenomenon of destruction to provide data for designing support and reinforcement. Following a discussion of the major goals and contents of these model experiments and principles for selecting materials to make the model, the specifications of force or load applying platforms used for model experiments in China, the USA, Japan, W. Germany, Italy, and Mozambique are briefly introduced.

6248
CSO: 4009/451

AUTHOR: CHEN Jianzhong [7115 1696 0022]
SUN Qida [1327 0120 6671]

ORG: None

TITLE: "A New Ultra-high Vacuum Thermal Gage--An Axial Hot Cathode Ionization Gage"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 3, 81 pp 1-6

ABSTRACT: This paper proposes a new axial thermal gage, with a structure different from that of the existing BA type gages. The characteristics of the new gage include high sensitivity, small scattering, simple structure, easy degassing, and wide range of measurement. Electron and ion movement tracks of the gage are analyzed and some experiments are carried out to determine the effects of the electrode structure and parameters on sensitivity.

AUTHOR: CHEN Peijin [7115 0012 3866]
WANG Humin [3769 4375 3046]

ORG: Both of Qinghua University

TITLE: "Reverse Diffusion Equation of Steady Viscous Flow Gas and Its Application"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 3, 81 pp 31-43

ABSTRACT: This paper proposes 2 solutions to the one dimensional reverse diffusion equation of steady viscous flow gas. The general form of the three dimensional (cylindrical coordinates) steady gaseous viscous flow reverse diffusion equation is also discussed. Attempts are made for 2 conditions of two dimensional space under a specific situation to produce the density distribution of reverse diffusion flow, but this work is obviously in need of further efforts. Finally, various applications of the reverse diffusion equation and its solution in vacuum technology, especially in diffusion pump system to obtain a clean vacuum are introduced.

AUTHOR: QIU Chuxiang [5941 2806 3276]

ORG: Hangzhou Electron Tube Plant

TITLE: "Reform of the Work Process of Stainless Steel Soldering "

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 3, 81 pp 50-51

ABSTRACT: When stainless steel is soldered in vacuum, with the vacuum lower than 10^{-5} torr, or if it is soldered in a hydrogen furnace, with the hydrogen dew-point higher than $-60^\circ C$, oxidation will occur to cause the soldered place to leak gas. In order to prevent stainless steel from oxidation in the course of rising temperature, it is necessary to apply nickel plating at the soldered place, but nickel plating is a complicated procedure, and the phenomenon of bubbling occurs easily. Based upon the fact that titanium has the action of making the crystal of steel finer and the fact that titanium is also a strong deoxidising agent, the author and colleagues adopted a new technique of not using nickel plating. On the soldering surface, a layer of titanium ointment is painted. The soldering work is successful in a $4 \times 10^{-4} - 10^{-5}$ torr vacuum. The soldered piece is air-tight after prolonged use under $-260^\circ C$. With this new method, stainless steel may be soldered to stainless steel and stainless steel to oxygen-free copper and a relatively high tensile strength may be obtained.

6248
CSO: 4009/430 END

JPRS 78932

9 September 1981

China Report

SCIENCE AND TECHNOLOGY

No. 125

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78932

9 September 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 125

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Theoretical Analysis of Effect of Langmuir Flow in Ring Laser
(Jian Yanan; JIGUANG, Apr 81) 1

Analytical Description of Time Characteristics of High Power Laser Pulses
(Yang Hanqian, Qu Zhimin; JIGUANG, Apr 81) 17

Structure, Output Characteristics of Pulsed Xenon Ion Laser
(Wang Yuzhi, et al; JIGUANG, Apr 81) 26

Characteristics of Pulsed Gold Vapor Laser Outlined
(Zhang Guiyan, et al.; JIGUANG, Apr 81) 35

Laser Triggered Spark Gaps Under Experimental Study
(Meng Shaoxian, et al.; JIGUANG, Apr 81) 38

Optic-Acoustic CO_2 Laser Spectrometer Used To Analyze, Test Gases
(Chen Chuanwen, et al.; JIGUANG, Apr 81) 42

Briefs
Microcomputer Fair 45

PUBLICATIONS

Table of Contents of 'DADIANJI JISHU' No 3, 1981 46

Table of Contents of 'JIGUANG' No 5, 1981 48

ABSTRACTS

ARCHITECTURE

JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] No 7, 20 Jul 81 51

CONSTRUCTION MACHINERY

GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] No 7, 1981.. 56

ELECTRONICS

DIANZI XUEBAO [ACTA ELECTRONICA SINICA] No 3, 1981 58

DIANZI JISHU [ELECTRONIC TECHNOLOGY] No 7, 1981 65

METALLURGY

JINSHU XUEBAO [ACTA METALLURGICA SINICA] No 3, 1981 66

APPLIED SCIENCES

THEORETICAL ANALYSIS OF EFFECT OF LANGMUIR FLOW IN RING LASER

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 1-8

[Article by Jiang Yanan [1203 0068 0589] of the Department of Precision Instruments of Qinghua University: "Theoretical Analysis of the Effect of Langmuir Flow in a Ring Laser." This article was received on 12 March 1980]

[Text] Abstract: The flow of gas in a gain medium is an important source of error in laser gyros. This article quantitatively discusses the drift of the frequency difference of opposite carrier waves brought about by the flow of active and non-active atoms in the gain medium. The article gives the theoretical formula and the computed values of Langmuir flow in the third order theory. This article emphasizes the use of statistical methods to treat the drift of frequency difference when a Gaussian beam passes through the gain field and the flow velocity field. It also gives the computational formulas for various conditions.

I. Introduction

In a ring-shaped laser, traveling wave oscillations in the clockwise and counterclockwise directions of propagation are maintained. Because the activeness of the gaseous gain medium is sustained by direct current discharge, unavoidably, this will cause gases to flow inside the discharge tube. In the He-Ne ring laser of small power, the typical value of the flow velocity is about several centimeters/second. This type of flow is called Langmuir flow. It will result in a split in frequency of the traveling waves in the clockwise and the counterclockwise directions. Its typical value $\Delta\nu_L$ is about several dozen hertz.

Everyone knows that when the ring laser undergoes a rotation Ω relative to the inertial space, because of the effects of relativity theory, a frequency difference will be produced between the clockwise and the counterclockwise traveling waves:

$$\Delta\nu_\Omega = |\nu^{CW} - \nu^{CCW}| = \frac{4S\cdot\Omega}{\lambda L} \tag{1}$$

where S is the area enveloped by the ring cavity, L is the length of the cavity of the ring, λ is the wavelength of the laser.

$K = \frac{4S}{\lambda L}$ is called the graduation factor of the gyro. To define a quantitative concept, the typical value of K in an actual laser gyro is about 1 hertz/degree/hour. Therefore, to obtain a sensitivity above 10^{-2} degrees/hour, all sources of error which can cause a drift in the frequency difference $\Delta\nu$ between the clockwise and the counterclockwise traveling waves must be stabilized at below 10^{-2} hertz.

We have already mentioned above that the typical value of Langmuir flow is $\Delta\nu_L \sim$ several dozen hertz. The seriousness of the error source causing a zero drift of the laser gyro can thus be seen.

For this, in an actual laser gyro, a double anode discharge tube is used (See Figure 1).

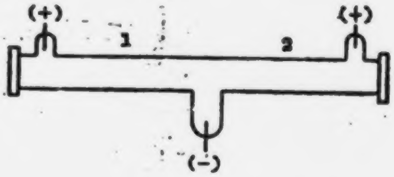


Figure 1. Dual circuit discharge tube 1, 2

Even so, because of the complexity and the instability of interaction among the Gaussian beam, the Langmuir flow velocity field and the gain field, significant constant drift and random drift will be brought about. In particular, in the four-frequency differential laser gyro, the result of differential motion is the elimination of some major error sources, but the drift caused by Langmuir flow will multiply. Therefore, in a high precision gyro, the study of the effects of Langmuir flow is very important.

In a He-Ne gaseous gain tube of direct current discharge, the so-called flow of gaseous atoms includes two types, the flow of active atoms (Ne*) and of nonactive atoms (such as He and nonactive Ne). Their directional flow will all cause the non-mutually countering effect described above--causing a frequency difference between the clockwise and counterclockwise traveling waves to occur--i.e., zero drift. But the physical mechanisms of zero drift caused by the nonactive atoms and the gain atoms are different, therefore they must be separately discussed.

The Langmuir flow effects of nonactive atoms are relatively simple. According to the effect of Fresnel traction of the velocity of light in the moving medium, the term of Langmuir drift in the nonactive medium is

$$\Delta\nu'_L = -\frac{4S}{\lambda L}\left(1-\frac{1}{n^2}\right)\overline{\Omega}' \tag{2}$$

where $\overline{\Omega}'$ is the equivalent angular velocity of the nonactive medium relative to the motion of the ring cavity.

Calculations show that under ordinary conditions, this term is smaller than the Langmuir drift in an active medium by three magnitudes. This article will emphasize the discussion of Langmuir flow effects of active atoms.

II. Basic Equations

Refer to references (1 - 3). The circular frequencies (ω_1 , ω_2) of the opposite traveling waves in the ring laser satisfy the following equations respectively

$$\omega_1=\Omega_1+\sigma_1+\rho_1 I_1+\tau_{12} I_2 \tag{3}$$

$$\omega_2=\Omega_2+\sigma_2+\rho_2 I_2+\tau_{21} I_1 \tag{4}$$

This is the result of the third order theory for the intensity of electrical polarization of an active medium. The formulas have omitted the corresponding terms related to locking because the questions discussed in this article are unrelated to locking, and they also signify that the ring laser should be operated at a point far away from the locked area. The formulas are completely satisfied by the four-frequency device used in this article. In the formulas, 1, 2 respectively represent the clockwise and the counterclockwise traveling waves. $\Omega_{1,2}$ is the harmonic oscillation of the empty cavity. σ is the chromatic dispersion coefficient of the active medium. ρ and τ are the gain saturation parameters of the medium.

From (3) and (4) we can obtain the circular frequency difference between the clockwise and the counterclockwise traveling waves

$$\begin{aligned}\omega=\Omega+(\sigma_2-\sigma_1)+(\tau_{21}-\rho_1)I\\ -(\tau_{12}-\rho_2)I_2\end{aligned} \tag{5}$$

where $\Omega = \Omega_2 - \Omega_1$ is the circular frequency difference of the empty cavity.

When considering the effects of radiation trapping and when using the average light intensity I and the light intensity difference i

$$I=\frac{1}{2}(I_2+I_1) \tag{6}$$

$$i=\frac{1}{2}(I_2-I_1) \tag{7}$$

we obtain

$$\begin{aligned}\omega=\Omega+(\sigma_2-\sigma_1)+2(\rho-\tau)i\\ -\Big[\frac{2R}{G}(\sigma_2\beta_2-\sigma_1\beta_1)\\ +(\tau_{12}-\tau_{21})+(\rho_1-\rho_2)\Big]I\end{aligned} \tag{8}$$

Deleting the term of light intensity difference, i.e., letting i = 0, and using the frequency parameter

$$\xi_i = \frac{\omega_i - \omega_0}{Ku} \quad i = 1,\ 2$$

equation (8) can be expressed as

$$\omega = \Omega(1+A) \tag{9}$$

$$A = \frac{G}{2Ku}\left(\frac{C}{L}\right)[S_\sigma + S_R + S_\tau + S_\rho] \tag{10}$$

A in equation (9) shows the existence of an active medium, it is a readjustment of the frequency difference of the empty cavity, called the ratio factor correction term. In equation (10), S_σ , S_R , S_τ , S_ρ respectively represent the difference correction terms of mode traction, radiation trapping, and self and mutual repulsion of modes.

Let

$$S = S_\sigma + S_R + S_\tau + S_\rho \tag{11}$$

These parameters can be written as the following under the condition where the double isotope Ne^{20} :Ne^{22} =1:1

$$S_\sigma = \frac{\frac{1}{2}[Z'_i + Z'_r]}{Z_{im}}$$

$$S_R = \frac{\left\{ -\frac{1}{2} RI[(Z'_r + Z_r)(b + \bar{b}) + (Z_r + Z_r)(b' + \bar{b}')] \right\}}{Z_{im}}$$

$$S_\tau = \frac{-\frac{1}{2}\eta I\left[\frac{Z'_i}{\xi} + \frac{Z'_i}{(\xi - \xi_t)}\right]}{Z_{im}}$$

$$S_\rho = \frac{-\frac{1}{2}\eta I[Z''_i + Z''_i]}{Z_{im}}$$

where $b=(Z_i - \eta Z_r')/Z_{im}$, Z_i and Z_r represent the imaginary and the real parts of the chromatic dispersion function of the plasma. ξ_t is the frequency pitch of the two types of isotopes. $Z_{im} = Z_i(0)$ is the maximum value of this function. Calculations show: S_σ and S_R are larger than S_τ , S_ρ by one magnitude(3).

III. General Description of the Langmuir Flow Effect

In the discharge tube of the ring laser, because of direct current discharge, the gain atoms have a definite flow velocity V. Because of the Doppler effect, the gain curves of the traveling waves 1 and 2 produce a 2KV circular frequency split. Thus, the frequency difference formula of the gyro becomes

$$\omega = \Omega(1 + A) - 2KV \cdot A \tag{12}$$

This shows that the circular frequency difference term of the Langmuir flow is:

$$\Delta\omega = -2KV A$$

This is because the split in the gain curves of the clockwise and the counterclockwise light has led to the introduction of different values in the gain medium due to the effects of traction and repulsion of the clockwise and counterclockwise light.

In the four-frequency differential laser, because of the simulataneous rotation of the left and right rotary gyro, added to the output signal of the left and right rotary differential

$$\Delta\omega = \omega_{left} - \omega_{right}$$

is

$$\Delta\omega = 4KV \cdot \bar{A} \tag{13}$$

This is the circular frequency drift term of the Langmuir flow effect in the four-frequency differential laser gyro, and in the equation

$$\bar{A} = \frac{1}{2}(A_{left} + A_{right}) \tag{14}$$

Figure 2 illustrates the working principles of the four-frequency differential gyro. The 90° quartz optical rotator causes the frequency pitch of the left and right rotary gyro to be $\frac{C}{2L}$ (half of the mode pitch). The cavity frequency controler and the piezoelectric components make sure that the left and right gyro works on symmetric operating points on the gain curves. To avoid competition between modes and symmetry of the gain curves, the devices are filled with an equal proportion of Ne^{20} and Ne^{22}. The photomagnetic Faraday component produces equal operating points of opposite partial frequency for the left and right gyros to avoid the lock area.

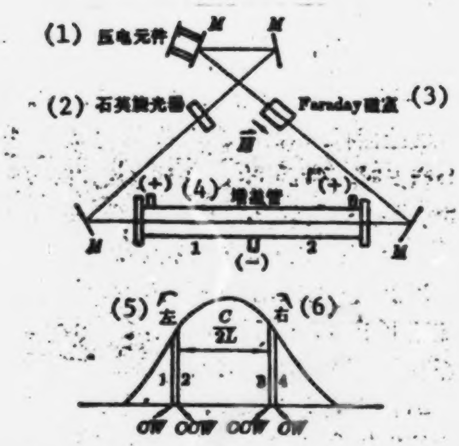


Figure 2. Simple illustration of the operating principle of the four-frequency gyro (M is the angular reflector)

Key:

1. Piezoelectric component
2. Quartz optical rotator
3. Faraday magnet chamber
4. Gain tube
5. Left
6. Right

Here we combine the parameters of the four-frequency device of the experiment to give a set of estimated values of Langmuir flow.

Let the effective value of the directional flow velocity of the gain atoms in the discharge tube be V = 1 centimeter/second, then, the frequency split of the gain curve is

$$\frac{KV}{\pi} = 0.0817 \text{ megahertz},$$

the Langmuir flow frequency drift introduced here is

$$\Delta\nu_L = \frac{4V}{\lambda}\bar{A} \tag{15}$$

$$\bar{A} = \frac{C}{2L}\frac{G}{Ku}\bar{S} \tag{16}$$

This device has a length of L = 63.3 centimeters, thus

$$\frac{C}{2L} = 241 \text{ megahertz}.$$

He-Ne filling pressure is P = 3.3 torr, thus η = 0.2; bandwidth of the emitted light is $\Delta\xi$ = 0.4, thus the gain/loss ratio is G/r = 1.17. Because r = 3%, we have G = 3.51%. Therefore

$$\frac{C}{2L}\frac{G}{Ku}=1.34\times10^{-8},$$

$$\bar{A}=0.963\times10^{-8},$$

$$\Delta\nu_L=61.1\text{ hertz.}$$

In the dual anode discharge tube, the gain and the flow velocity of atoms of the discharge tube of two sections are respectively denoted as G_1, G_2, V_1, V_2. Thus

$$\Delta\nu_L=\frac{4(G_2V_2-G_1V_1)}{\lambda G}\bar{A}m \tag{17}$$

Let

$$G_1 = G_2 = \frac{1}{2}G,$$

$$\Delta\nu_L=2\,\frac{V_2-V_1}{\lambda}\bar{A}.$$

When $V_2 - V_1$ = 1 centimeter/second, $\Delta\nu_L \approx$ 30.6 hertz.

Measurements of the experiment show that when the electric current differential between the two segments of the discharge tube is ΔI = 1 milliamperes, $\Delta\nu_L$ = 52 hertz. This shows that at this time, the differential value of the flow velocity of the two segments of the discharge tube is

$$V_2 - V_1 = 1.7 \text{ centimeters/second.}$$

In the above, we started out from the directional flow velocity V of the gain atoms present in the discharge tube and discussed in general the cause of the Langmuir flow drift and numerical estimation.

$\Delta\nu_L$ and G, V are directly proportional, but generally speaking, the G, V in the gaseous discharge tube are not constant. They are distributed radially and axially according to a definite pattern. Therefore, to further discuss the zero drift of Langmuir flow, we will analyze the gain coefficient and the field distribution of the flow velocity.

IV. Lateral Distribution of the Velocity and the Gain Coefficient Fields

(1) Flow Velocity Field

In the positive cylindrical region of the closed direct current He-Ne discharge tube there exist two types of opposite flow of gaseous atoms. One type is the Langmuir flow, its direction is from the negative pole to the positive pole, it is due to the negative charge effect of the wall of the discharge tube. When the free range of the ions $\lambda_+ \ll a$ (radius of the discharge tube), the velocity distribution in the direction r along the radius of the capillar tube is

$$V_L(r)=V_L(0)\left[1-e^{\frac{r-a}{\lambda_+}}\right]\text{[4]} \tag{18}$$

In the 3 torr He:Ne=7:1 discharge tube, $\lambda_+ \sim 0.05$ millimeters.

The result of Langmuir flow causes an atmospheric pressure difference between the positive and the negative poles of the closed discharge tube. Under the effect of the pressure difference, a second type of flow is formed in the discharge tube: a viscous flow (Poiseuille flow) V_p (r) from the positive pole to the negative pole, its distribution is

$$V_p(r)=V_p(0)\left[1-\left(\frac{r}{a}\right)^2\right]^{[4]} \tag{19}$$

In a closed discharge tube, a stable flow is formed under an equilibrium condition, thus

$$\int_0^{2\pi}\int_0^a V_p(r)\,r\,dr\,d\theta=\int_0^{2\pi}\int_0^a V_L(r)\,r\,dr\,d\theta$$

Let a = 0.75 millimeters, then $a/\lambda_+ \approx 15$, we have

$$V_L(0)\approx\frac{4}{7}V_p(0)_\circ$$

The flow velocity V(r) of the gaseous atoms is a combination of the two opposite flows described above, i.e.

$$\begin{aligned}V(r)&=V_p(r)-V_L(r)\\&=V_0\left[1-\frac{7}{8}\left(\frac{r}{a}\right)^2+\frac{4}{8}e^{\frac{r-a}{\lambda_+}}\right]\end{aligned} \tag{20}$$

We know from equation (20) that when

$$\left\{\begin{array}{l}r = a\\ r = 0.65a\end{array}\right. \qquad V(r) = 0$$

and in the region $r <$ 0.6 millimeters, the above equation simplifies to

$$V(r)=V_0\left[1-\frac{7}{8}\left(\frac{r}{a}\right)^2\right] \tag{21}$$

Equation (21) can be used for the flow velocity in the region passed through by the Gaussian beam discussed in this article.

Figure 3 gives the flow velocity diagram obtained from equation (20). It can be seen from the diagram that in the central area of the discharge tube, atoms flow from the positive pole to the negative pole. In the border regions of the discharge tube, atoms flow from the negative pole to the positive pole. In the cross section, the total flow towards the positive and the negative poles are equal(5).

But it should be pointed out that the actual flow velocity field is more complex than this and should be further studied.

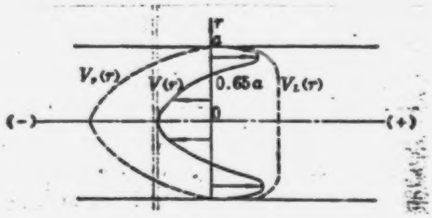


Figure 3. Lateral distribution of the flow velocity in the discharge tube V(r)

(2) The Field of Gain Coefficients

The distribution of the gain coefficients determined by the distribution of the electron density n_e in the discharge tube (Figure 4) is

$$G(r) = G_0 J_0\left(\frac{2.4r}{a}\right) \tag{22}$$

while the one-way gain coefficient generally defined should be the average value of G(r) in the region passed through by the Gaussian beam.

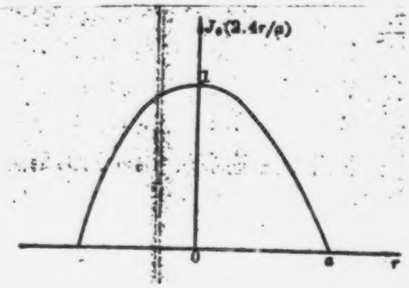


Figure 4. Lateral distribution of the gain field in the discharge tube $G(r) = G_0\ J_0\ (r)$

V. Zero Drift of Langmuir Flow Under an Eccentric Guassian Beam

We discussed above the lateral distribution of the gain coefficient G(r) and the flow velocity V(r) along the discharge tube. The problem facing this article is the zero drift $\Delta\nu_L$ of the "Langmuir" flow created when the Gaussian beam of an intensity distribution (e^{-r^2/ω^2}) passes through the gain field and the flow velocity field at eccentricity α in the discharge tube.

Because G, V are functions of r, $\Delta\nu_L$ must also be a function of r. Thus, the Langmuir zero drift that exerts an effect in the experiment should be directly proportional to the statistical average value of G(r) · V(r) with e^{-r^2/ω^2} as the weighting factor.

From equations (15) and (16)

$$\Delta\nu_L = QGV \tag{23}$$

where

$$Q = \bar{A}\,\frac{4}{\lambda\bar{G}} \tag{24}$$

Because the Gaussian beam and the G, V fields have an eccentricity α, we select the origin 0 of the cylindrical coordinates (r, θ) to coincide with the center of the Gaussian beam, thus the gain field and the flow velocity field having the center of the discharge tube 0' in these coordinates as the center of symmetry are respectively $G(r')$, $V(r')$, while $\overline{00'} = \bar{\alpha}$. See Figure 5.

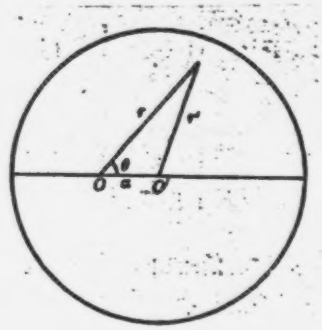


Figure 5. The center of the Gaussian beam deviates from the center 0' of the discharge tube, the deviation is α

$$(r')^2 = r^2 + a^2 - 2ra\cos\theta$$

$$\langle\Delta\nu_L\rangle_e = Q\langle G\cdot V\rangle_e$$

$$= Q\,\frac{\int_0^{2\pi}\int_0^{\infty} e^{-r^2/w_0^2}\,G_0 J_0(2.4r'/a)\bar{V}(r')\,r\,dr\,d\theta}{\int_0^{2\pi}\int_0^{\infty} e^{-r^2/w_0^2}\,r\,dr\,d\theta} \tag{25}$$

From this we can calculate

$$\begin{aligned}\langle\Delta\nu_L\rangle_e &= QG_0V_0\Big[0.6951 - 2.735\Big(\frac{a}{a}\Big)^2 \\ &\quad + 3.879\Big(\frac{a}{a}\Big)^4\Big] \\ &= QG_0V_0 f(a)\end{aligned} \tag{26}$$

Retaining the second order terms, we have

$$f(a) = 0.6951 - 2.735\Big(\frac{a}{a}\Big)^2 \tag{27}$$

In a closed dual anode discharge tube

$$\langle \Delta\nu_L \rangle_\alpha = Q[G_{10}V_{10}f(\alpha_1) - G_{20}V_{20}f(\alpha_2)] \tag{28}$$

where G_{10}, G_{20} and V_{10}, V_{20} are respectively the gain coefficient and flow velocity at the centers of the two segments 1 and 2 of the discharge tube respectively. See Figure 2.

$G_0 = G_{10} + G_{20}$, let the two segments of the discharge tube be centered, i.e., $\alpha_1 = \alpha_2 = \alpha$, then

$$\langle \Delta\nu_L \rangle_\alpha = Q[G_{10}V_{10} - G_{20}V_{20}]f(\alpha) \tag{29}$$

Obviously, when $G_{10}V_{10} = G_{20}V_{20}$, $\langle \Delta\nu_L \rangle_\alpha = 0$, i.e., the zero drift of Langmuir flow is zero. But when

$$G_{10} = G_{20} = \frac{G_0}{2}$$

$$\langle \Delta\nu_L \rangle_\alpha = QG_0\left(\frac{V_{10} - V_{20}}{2}\right)f(\alpha) \tag{30}$$

VI. Relative Systematic Zero Drift γ_α and Random Zero Drift β_α

This article is concerned about the added zero drift introduced by the eccentricity α of the base mode of oscillation in the ring cavity relative to the discharge tube because of initial maladjustment and the random change of zero drift introduced by the continuous change ($\Delta\alpha$) of α due to such factors as instability of the cavity in the experimental process.

To describe the relative change of this type of zero drift, two parameters γ_α, β_α are introduced. They are defined as

$$\gamma_\alpha = \frac{\langle \Delta\nu_L \rangle_\alpha - \langle \Delta\nu_L \rangle_{\alpha=0}}{\langle \Delta\nu_L \rangle_{\alpha=0}} = -3.935\left(\frac{\alpha}{a}\right)^2 \tag{31}$$

$$\beta_\alpha = \frac{\dfrac{d\langle \Delta\nu_L \rangle_{\alpha+\Delta\alpha/2}}{d\alpha} \cdot \Delta\alpha}{\langle \Delta\nu_L \rangle_\alpha} = -\frac{3.935(2\alpha+\Delta\alpha)\Delta\alpha}{a^2} \tag{32}$$

Let a = 0.75 millimeters, we have Table 1.

Table 1. The relative variation γ_α of the zero drift of Langmuir flow when the Gaussian beam deviates from the center $\bar{\alpha}$ of the gain tube

$\bar{\alpha}$ (millimeter)	$\bar{\gamma}_\alpha$
0.01	-7.0×10^{-4}
0.075	-3.9×10^{-2}
0.1	-7.0×10^{-2}
0.2	-0.25

Let a = 0.75 millimeter, α = 0.1 millimeter, we have Table 2.

Table 2. Relative variation β_α of the zero drift of the Langmuir flow introduced by the random variation $\Delta\alpha$ of α when the Gaussian beam deviates from the gain tube center by $\bar{\alpha}$ = 0.1 millimeter.

$\Delta\alpha$ (millimeter)	$\bar{\beta}_\alpha$
0.001	-1.4×10^{-3}
0.01	-1.47×10^{-2}
0.02	-3.08×10^{-2}
0.03	-4.83×10^{-2}
0.05	-8.75×10^{-2}

It can be seen from the above that readjustment of the ring cavity should make the deviation α as small as possible, thus under an equal amount of random deviation $\Delta\alpha$, the random variation of the zero drift of the Langmuir flow becomes small.

VII. Zero Drift of Langmuir Flow When the Gaussian Beam Passes Through Obliquely(7)

In an actual ring cavity, the Gaussian beam also passes through the discharge tube obliquely. At this time, on the central z axis of the oblique Gaussian beam, the distribution of G, V at different z is different. This is equivalent to the presence of a different deviation $\alpha(z)$ at different z. See Figure 6.

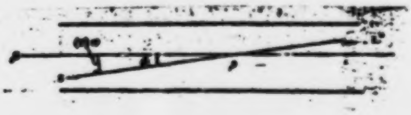


Figure 6. Drift of Langmuir flow when the Gaussian beam (along the z axis) passes through the gain tube obliquely

To further explain this problem, we must discuss the distribution of the gain and flow velocity along the z axis.

The one-way gain coefficient G used in previous discussions necessarily neglects the distribution of gain along the z axis. Here we introduce the gain density g, i.e., the concept of the gain value in a unit length. In cylindrical coordinates, it is $g(r, \theta, z)$, and

$$G(r\theta)=\int_0^{l_0} g(r,\theta,z)dz.$$

The relationship between g (r, θ, z) and $\overline{G}$ is

$$\overline{G}=\frac{\int_0^{l_0}\int_0^{2\pi}\int_0^{\omega_0} g(r,\theta,z)\,r\,dr\,d\theta\,dz}{\int_0^{2\pi}\int_0^{\omega_0} r\,dr\,d\theta} \tag{33}$$

$0 \rightarrow l_0$ is the length of the gain region.

The above equation shows that the one-way gain $\overline{G}$ is the radial average of the gain density in the effective zone of the Gaussian beam and the axial cumulative value. Obviously, when the Gaussian beam moves inside the discharge tube, the one-way gain $\overline{G}$ provided to it by the gain tube will also change.

The Langmuir zero drift when the Gaussian beam passes through the discharge tube obliquely is written as $\langle\Delta\nu_L\rangle_{\alpha(z)}$, $\alpha(z)$ is the deviation of the center of the Gaussian beam at z from the center of the tube.

$$\langle\Delta\nu_L\rangle_{\alpha(z)}=\frac{\left\{Q\int_0^{l_0}\left[\int_0^{2\pi}\int_0^{\omega_0} e^{-r^2/\omega_0^2} g(r',z)\times V(r',z)\,r\,dr\,d\theta\right]dz\right.}{\int_0^{2\pi}\int_0^{\omega_0} e^{-r^2/\omega_0^2}\,r\,dr\,d\theta} - Q\int_0^{l_0} V_0 f[\alpha(z)]dz \tag{34}$$

In the dual anode discharge tube, let the lengths of the two segments of the discharge tube be the same, then

$$\langle\Delta\nu_L\rangle_{\alpha(z)}=Q\left\{G_{10}V_{10}\frac{\int_0^{\frac{l_0}{2}} f[\alpha_1(z)]dz}{\frac{l_0}{2}} - G_{20}V_{20}\frac{\int_{\frac{l_0}{2}}^{l_0} f[\alpha_2(z)]dz}{\frac{l_0}{2}}\right\} \tag{35}$$

where $G_{10}=g_{10}\frac{l_0}{2}$, $G_{20}=g_{20}\frac{l_0}{2}$.

In the following, we will progress further to give the actual form of $\alpha(z)$ to complete integration. Let the central axis z of the Gaussian beam and the central axis z' of the discharge tube intersect in space at the point of intersection 1', the angle of intersection is ψ. Then, $\alpha_1(z)$, $\alpha_2(z)$ can use the uniform expression

$$\alpha(z) = (z - l')\tan\psi \qquad (36)$$

$\alpha(z)$ has l' and ψ as its parametric variables, thus the $\langle\Delta\nu L\rangle_{\alpha(z)}$ above can be rewritten as $\langle\Delta\nu L\rangle_{V,\psi}$ for more clarity.

Also, let $G_{20} = G_{10} = \frac{1}{2}G_0$, $V_{10} = V_{20} = V_0$,
then

$$\langle\Delta\nu_L\rangle_{l',\varphi} = \frac{2.735\times QG_0V_0l_0^3}{a^2} \times \left(\frac{1}{2}-\frac{l'}{l_0}\right)\tan^2\varphi \qquad (37)$$

The relative variations β_ψ, $\beta_{l'}$ introduced by $\langle\Delta\nu L\rangle_{V,\psi}$ when ψ or l' changes (due to a change in the shape of the cavity are defined as

$$\beta_\varphi \equiv \frac{\dfrac{d\langle\Delta\nu_L\rangle_{l',\varphi}}{d\varphi}\cdot\Delta\varphi}{\langle\Delta\nu_L\rangle_0} \qquad (38)$$

Calculations yield

$$\beta_\varphi = 7.86\left(\frac{l_0}{a}\right)^2\left(\frac{1}{2}-\frac{l'}{l_0}\right)\tan\varphi\cdot\Delta\varphi \qquad (39)$$

$$\beta_{l'} \equiv \frac{\dfrac{d\langle\Delta\nu_L\rangle_{l',\varphi}}{dl'}\cdot\Delta l'}{\langle\Delta\nu_L\rangle_0} \qquad (40)$$

Calculations yield

$$\beta_{l'} = -3.93(\tan^2\varphi)\cdot\frac{l_0}{a^2}\Delta l' \qquad (41)$$

Let the length of the gain region of the discharge tube l_0 = 200 centimeters, a = 0.75 millimeters, then

a) β_ψ, let $l' = \frac{1}{4}l_0$, $\psi = 2'$, listed in Table 3.

Table 3. Relative variation β_ψ of the zero drift of Langmuir flow introduced by the changes in inclination ψ when the Gaussian beam passes obliquely through the gain tube.

$\Delta\psi$	β_ψ
10"	3.5×10^{-3}
1'	2.1×10^{-2}
2'	3.5×10^{-2}

b) $\beta_{1'}$ let $\psi = 2'$, listed in Table 4.

Table 4. Relative variation $\beta_{1'}$ of the zero drift of Langmuir flow introduced by the variation in the point of intersection 1' when the Gaussian beam passes obliquely through the gain tube

$\Delta 1'$ (millimeter)	$\overline{\beta_{1'}}$
1	-3.5×10^{-4}
10	-3.5×10^{-3}

The β_α, $\overline{\beta_{1'}}$, β_ψ, given above respectively represent the relative variation of the zero drift of Langmuir flow introduced when the central axis z of the Gaussian beam translates or inclines towards the central axis z' of the discharge tube. But under ordinary conditions, z and z' are spatially nonintersecting. We can prove that the shortest distance between z and z' must be perpendicular to z, z'. Let z be translated along the direction of this perpendicular line to the shortest distance a_0, it will then intersect the z' axis at 1', with an angle of intersection ψ. Then,

$$a^2(z) = a_0^2 + (z-l')^2 \tan^2\varphi$$

f (α) = 0.6951

$$-\frac{2.735}{a^2}[a_0^2 + (z-l')^2 \tan^2\varphi]$$

It can be seen under this situation

$$\beta = \beta_{a_0} + \beta_{l'} + \beta_\varphi \qquad (42)$$

where β_α, $\overline{\beta_{1'}}$, β_ψ are respectively according to equations (32), (41), (39). They will not be discussed here again.

This article was presented during the course of developing the "four-frequency differential laser gyro" prototype jointly by Qinghua University, the State Measurement Sciences Academy, the Suzhou First Optical Instruments Plant. Colleagues such as Feng Tiesun [7458 6993 5549], Liu Weimin [0491 5898 3046], and Bao Chengyu [0545 2052 3768] provided assistance. The comrades of the Measurement Academy also conducted the corresponding experimental research, we thank them here.

References

(1) Gao Bolong [7559 0130 7893], "Ring Laser Lecture Notes".

(2) Aronowitz F., Appl. Opt., 1972, 11, 2146.

(3) Aronowitz F. et al., IEEE J. Quant. Electr., 1974, QE-10, 201.

(4) Podgorski, T. L., Aronowitz F., IEEE, J. Quant. Electr., 1968, QE-4, 4.

(5) Druyvestey M. J., Physica., 1935, 2, port 1, 255-266.

(6) Shimagai Kanfu, Tominaga Itsuro, "Vacuum Physics and Application", 1971.

(7) Liao Fuzhong [1675 1788 0022], "Laser", 1979, 6, No 12, 1.

9296
CSO: 4008/421

APPLIED SCIENCES

ANALYTICAL DESCRIPTION OF TIME CHARACTERISTICS OF HIGH POWER LASER PULSES

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 9-13

[Article by Yang Hanqian [2799 3211 0241] and Qu Zhimin [2575 1807 2404] of the Shanghai Laser Technology Institute and Liu Songhao [0491 7313 6275] and He Guangsheng [6378 0342 3932] of the Shanghai Optics and Fine Mechanics Institute of the Chinese Academy of Sciences: "Analytical Description of the Time Characteristics of High Power Laser Pulses." This article was received on 14 May 1980]

[Text] Abstract This article expands the studies by Wagner and Lengyel(1), obtains the solution of the time parameters of high power laser pulses, gives the mathematical relationship of the time a pulse is established, and brings out the effects of the section of the active medium upon the time a pulse is established, the single pulse condition and the pulse width.

The time parameters of high power laser pulses are the major variables(1) that describe the variation of each physical quantity in time during the course of laser oscillations. The time of establishment of a pulse T_r is also an important physical quantity(2,3). In the past, several methods of estimation(3,4) were used to determine T_r, while ordinarily, only the numerical solution(1,5) by the computer is given. Articles of recent years have described various methods to analytically describe the process(6,7) of establishment of a light pulse. This article has used different methods to sum up the problem into one seeking a solution for the time parameter and more precise results have been obtained. The method of derivation in this article and the results are suitable for analysis of the single pulse in the relaxation oscillation process.

I. Solution of the Time Characteristic in the Oscillation Process

1. Solution of the Time Parameter

To describe the process of the establishment of a pulse, reference (1) divides the pulse into three zones, zone A, zone B and zone C. In zone B, the form of the solution of the time parameter of the pulse is

$$t' = \int_{z_1}^{z} \frac{dz}{F(z)}。 \qquad (1)$$

The function to be integrated is

$$F(z) = e^{-z_1} - e^{-z} + z_1 - z_0 \tag{2}$$

See reference (1) for an explanation of the symbols.

At first glance, the integration of the above equation does not seem to be complicated, but seen from the point of view of calculus, it is impossible to obtain the analytic form of the original function. Reference (1) uses the numerical solution obtained by the computer. To seek the mathematical relationship among the physical quantities, it is best to obtain the approximate analytic solution of the time parameter. We first substitute the variables of the function to be integrated and take

$$x = -\ln \frac{n}{n_1} \tag{3}$$

thus we obtain the relationship between x and z

$$x = z + x_p,\ x_p = -z_1,$$

and

$$x_1 = 0.01,\ x_2 = x_f - 0.01.$$

After substitution of variables, the form of the solution of the time parameter in zone B ($x_1 < x < x_2$) is

$$t' = \int_{x_1}^{x} \frac{dx}{F(x)}. \tag{4}$$

The function to be integrated is

$$F(x) = \frac{1}{n_p}[n_1 - n_p x - n_p \exp(-x + x_p)] \tag{5}$$

In equation (5), the physical meaning of the exponential term is very clear, it represents a physical parameter of the system--the inverse density n of the number of particles. We expand the exponential term by its power. This expansion signifies the expansion of the values of the inverse density n of the number of particles in an undisturbed stable state, then we retain the first three terms to obtain the second degree approximate analytic solution.

The approximate analytic expression of the time parameter in zone B obtained by computation is

$$t' - t_p = -\frac{1}{b} \ln \left| \frac{(x - x_p) - b}{(x - x_p) + b} \right|, \tag{6}$$

where the factor

$$b = \left[2\left(a + \ln \frac{n_p}{n_1}\right)\right]^{1/2}$$

and the factor

$$a = \frac{n_1}{n_p} - 1.$$

2. Solution of the Time of Establishing the Pulse

Now we define the time of establishing a pulse after the switch is turned on as the period when the density of the number of photons start out from an initial value ψ_i to the moment it reaches its peak value ψ_p

$$T_r = T_1 - t_1' = \frac{1}{a}\ln\left(1+\frac{n_1-n_p}{200\varphi_t}\right) + \frac{1}{b}\ln\left|\frac{(0.01-x_p)-b}{(0.01+x_p)+b}\right|. \tag{7}$$

To make the above computation sufficiently precise, we change the interval of integration, taking $x_1 = 0.1$, $x_2 = x_f - 0.1$, thus, making the interval of zone B smaller improves the precision of the value T_r. Similar to the above method, the time of establishment of a pulse obtained by computation is

$$T_r = T'_1 - t_1 = \frac{1}{a}\ln\left(1+\frac{n_1-n_p}{20\varphi_t}\right) + \frac{1}{b}\ln\left|\frac{(0.1-x_p)-b}{(0.1-x_p)+b}\right|. \tag{8}$$

where T'_1 corresponds to the time interval of the interval (0, 0.1) of integration, t_1 corresponds to the time interval of the interval (x_p, 0.1) of integration.

Similarly, we can define the pulse attenuation time as the time when the density of the number of photons progresses from ψ_p to the end value

$$T_f = t_2 - T'_2 = -\frac{1}{b}\ln\left|\frac{x_f-x_p-0.1-b}{x_f-x_p-0.1+b}\right| + \frac{1}{C}\ln\left[1+\frac{n_p-n_f}{20\varphi_t}\right]. \tag{9}$$

where T'_2 corresponds to the time interval of the interval (x_f, $x_f - 0.1$) of integration, t_2 corresponds to the time interval of the interval (x_p, $x_f - 0.1$) of integration. The factor $C = 1 - \frac{n_f}{n_p}$.

The results listed in Table 1 show that when $n_i / n_p \leqslant 11$, the errors between the values of T_r calculated from equation (8) and the computer results are smaller than 5%.

Table 1. Comparison of the values of T_r and computer results

(1) n_i/n_p	1.221	1.492	2.014	3.004	4.962	6.050	9.035	11.023
(2) T_r 计算机解	99.4	47.8	24.6	13.1	6.96	5.54	3.59	2.93
(3) T_r 按(8)式计算值	98.1	47.5	24.3	12.8	6.71	5.32	3.43	2.78

(4) 注：T_r 值均以 T 为单位。

Key:
1. n_i / n_p
2. Computer solution of T_r
3. Value of T_r calculated from equation (8)
4. Note: The values of T_r are all in units of T.

II. Single Pulse Condition and Analysis

1. Establishing the Single Pulse Condition

According to reference (2) and equation (8) in the previous section, we can determine the single pulse condition as

$$\frac{1}{a}\ln\left(1+\frac{n_i-n_p}{20n_i}\right)+\frac{1}{b}\ln\left|\frac{(0.1-\alpha_p)-b}{(0.1-\alpha_p)+b}\right|>t'_s \qquad (10)$$

Here, the switching time t'_s is in units of T.

The above equation shows that to obtain single pulse output, we must adjust the time of establishment T_r of the pulse or the switching time t_s, it is best to adjust these two times to be nearly equal. Because of the relationship of the logarithmic function, obviously, the magnitude of T_r is mainly determined by the factors a and T, i.e., determined by the inverse density n_i of the initial number of particles, the inverse density n_p of the number of particles of the threshold value, the length of the cavity L and the loss coefficient r. But to obtain the largest energy output, we must seek the best penetration coupling (6), therefore the magnitude of T_r is mainly determined by n_i, n_p and L. The larger the n_i, the lower the n_p, or the shorter the L, the faster the T_r. Because n_i and n_p are both miscroscopic quantities, from equation (1) in reference (2) we know n_i is determined by the pumping power. Therefore, as the pumping power increases, the value of T_r reduces, thus multiple pulses are easily produced.

In addition, according to the threshold conditions, n_p is directly proportional to $2\pi\tau\Delta\nu$, while the value of $2\pi\tau\Delta\nu$ increases as temperature increases, therefore T_r increases as temperature rises. If a device can generate a single pulse under room temperature, then under low temperatures, it can easily produce multiple pulses of low power. This is consistent with the experimental results (8). Also, because the threshold value n_p is directly proportional to the active section S, therefore as the active section increases, T_r becomes larger, and a single pulse is more easily obtained.

2. Obtaining Single Peak and Multiple Peak Zones

If we use the inverse density n_i of the initial number of particles as the vertical coordinate and the switching time t_s as the horizontal coordinate as in Figure 1, then according to equation (10) and the threshold value condition, we can obtain the three zones, I, II and III. The boundary of zone I and zone II is the stationary threshold value, and the boundary of zone II and zone III is the curve of the equality in equation (10). Thus, in zone I, because the initial inverse density of the number of particles is too low, no pulse is output, while zone II is the single pulse output zone, zone III is the multiple pulse output zone.

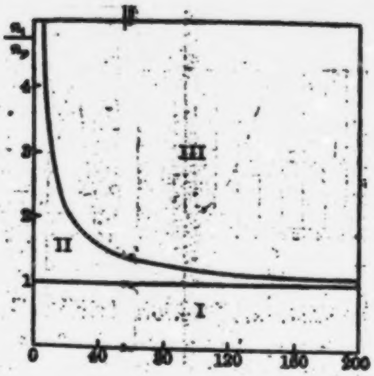
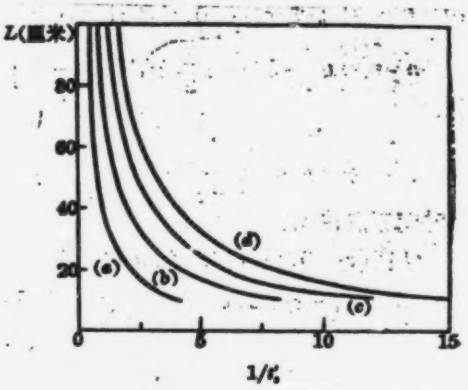


Figure 1. Single Peak and Multiple Peak Operating Zones

In addition, the length of the cavity L can be used as the vertical coordinate and the $1/t_s'$ can be used as the horizontal coordinate to draw the single peak and multiple peak zones under different pumping levels ($1/t_s'$ is measured in units of $C \cdot r \times 10^{-3}$). The upper right of each curve is the single peak zone and the lower left is the multiple peak zone, as shown in Figure 2.



L (centimeter)

Figure 2. Single peak and multiple peak output zones using cavity length L as the variable under different pumping levels

a—n_i/n_p=2.014; b—n_i/n_p=3.004;
c—n_i/n_p=4.065; d—n_i/n_p=4.968

It can be seen from Figure 2 that if the switching time t_s' is given, then to obtain a single peak output, the shorter the cavity length, the smaller the maximum value of n_i / n_p allowable. The longer the cavity, the higher the maximum value of n_i / n_p allowable. This coincides with experimental results$^{(5)}$.

III. Analytic Description of the Oscillation Process

To find the characteristics of variation of the inverse density n of the number of particles and the density ψ of the number of photons along with time, we must first find the relationship of n and ψ with the variable x. We can derive the relationship of n and ψ with the variable x from assumption (3) in the previous section and equation (11) in reference (1) as

$$n=n_i e^{-x} \tag{11}$$

and

$$\varphi=\frac{n_p}{2}x \tag{12}$$

then we can find n(t') and ψ (t') from the relationship between t' and x, x is directly proportional to the area encircled below the curve of the expansion of the density ψ (t) of the number of photons along the time axis, i.e., x represents the energy parameter of the laser.

In the following, we first find the n and ψ of the A zone ($0 \leqslant x \leqslant 0.1$) as

$$n=n_i \exp\left[-\frac{2\varphi_i}{n_p a}\left(\sinh\frac{at'}{2}\right)\left(\exp\frac{1}{2}at'\right)\right] \tag{13}$$

$$\varphi=\varphi_i e^{at'}, \tag{14}$$

taking t = 0 as the origin of time.

The n and ψ in the B zone ($0.1 \leqslant x \leqslant x_f - 0.1$) are

$$n=n_i \exp\left[-b\tanh\frac{1}{2}b(t'-t_p)-x_p\right] \tag{15}$$

$$\varphi=\varphi_p \operatorname{sech}^2\frac{1}{2}b(t'-t_p) \tag{16}$$

the origin of time is at t_p.

The n and ψ in the C zone ($x_f - 0.1 \leqslant x \leqslant x_f$) are

$$n=n_i \exp\{-x_f+0.1\exp[-C(t'-T_2)]\} \tag{17}$$

$$\varphi=\frac{n_p \cdot C}{20}\exp[-C(t'-T_2)] \tag{18}$$

The origin of time is the time t_2 corresponding to x_2.

The above equations show that the inverse density n of the number of particles in zone A drops exponentially, the density ψ of the number of photons increases exponentially with time, therefore, zone A is a rising zone or a growing zone. Zone B is the zone where the main peak of the pulse is, n attenuates drastically, when point t_p reaches n_p, the time distribution of the main peak of the light pulse is a square type hyperbolic secant function, not a Gaussian type. At point

t_p the peak value ψ_p is reached. In zone C, n and ψ both exponentially attenuate to the final values. Figure 3 shows a diagrammatic description of the variation process of n and ψ .

Equation (16) shows that the shape of the part of the main peak of the pulse is symmetric, and from that equation, we can calculate the half maximum full width (HMFW) of the pulse

$$\delta' = \frac{3.53}{b} \tag{19}$$

or

$$\delta = \frac{3.53}{b} T \tag{20}$$

Equation (20) shows δ is determined by b and T, and it is also determined by n_i, n_p, L and r, and the method of analysis is the same as in the previous section, and we can conclude that the higher the pumping power or the shorter the cavity or the lower the temperature, the narrower the pulse width, and vice versa. The effects of the pumping power and the length of the cavity upon the output pulse width coincide with the experimental results$^{(5)}$. Similarly, the effects of the active section S upon the pulse width can be predicted. The larger the S the wider the pulse width. Figure 4 shows the corresponding narrowing of the pulse width as the value of n_i / n_p increases.

Figure 5 shows a comparison of the two kinds of computational results of the pulse wave form. In the central region, the two coincide very well and they differ only slightly at the lower part of the two wings of the curves.

Table 2 lists the comparison of the two kinds of computational results of the pulse width. For values of δ' , the error between these values and the computer solutions when $n_i / n_p \leqslant 6$ is less than 10%, when $n_i / n_p \geqslant 6$ and $n_i / n_p \leqslant 11$, the error is within 20%, and the two basically coincide.

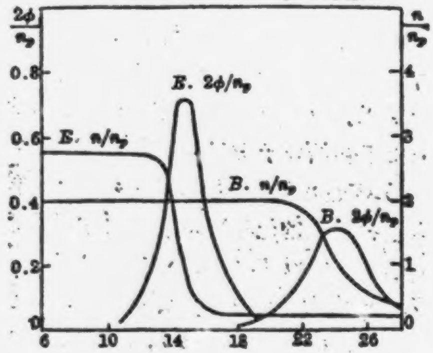


Figure 3. Pulse Oscillation Process

t' is measured in units of T.

$B \text{—} \frac{n_i}{n_p} = 2.014;\ \frac{2\varphi_p}{n_p} = 0.314$

$E \text{—} \frac{n_i}{n_p} = 2.718;\ \frac{2\varphi_p}{n_p} = 0.718$

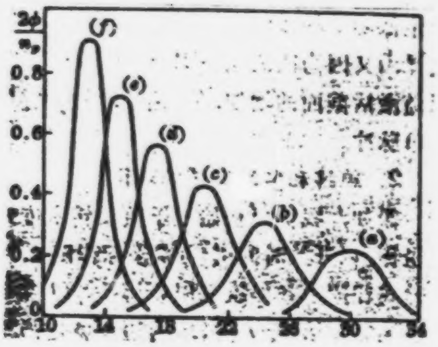


Figure 4. Variation in Pulse Width

a—$n_t/n_p=1.822$; *b*—$n_t/n_p=2.014$; *c*—$n_t/n_p=2.226$; *d*—$n_t/n_p=2.460$; *e*—$n_t/n_p=2.718$; *f*—$n_t/n_p=3.004$

t' is in units of T.

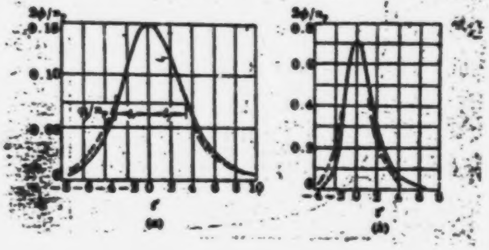


Figure 5. Comparison of the Analytic Solution and the Computer Solution of the Oscillating Waveform of the Light Pulse

(*a*)—$n_t/n_p=1.649$; (*b*)—$n_t/n_p=2.718$

Solid line is the computer result; dotted line is the analytic result, t' is time in units of T.

Table 2. Comparison of the Results of the Two Methods of Computation of the Pulse Width

	n_i/n_p	1.221	1.492	2.014	3.004	4.958	6.050	9.025	11.093
(1)	δ' 计算机解	16.4	8.25	4.50	2.70	1.75	1.53	1.23	1.13
(2)	δ' 按(20)式计算	17.1	8.24	4.46	2.63	1.63	1.38	1.04	0.91

Key:

1. δ' Computer solution
2. δ' Calculated according to equation (20)

References

(1) Wagner W. G., Lengyel, B.A. JAP, 1963, 34, 2040.

(2) Vuylsteke A.A., JAP, 1963, 34, 1615.

(3) Writing Group of Laser Physics; "Laser Physics", 1975, 215.

(4) Dr. Dieter Ross, Laser Light Amplifiers and Oscillators, 1969, 340.

(5) Arecchi F. F. et al, "Nuovo Cimento," 1964, 34, 1458.

(6) Huang Hongjia [7806 1347 0857]; "Chinese Science", 1974, 3, 247.

(7) Song Mingzhao [1345 6900 6856]; "Laser", 1978, 5, No 5-6, 28.

(8) Benson R.C., Mirarchi M. R.; IEEE Trans., 1964, Mil-8, 13.

9296
CSO: 4008/421

STRUCTURE, OUTPUT CHARACTERISTICS OF PULSED XENON ION LASER

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 18-21

[Article by Wang Yuzhi [3769 3768 5347], Xie Peiliang [6200 1014 5328], Dong Jingxing [5516 2529 2502], and Feng Bingfang [7458 3521 5364] of the Shanghai Optics and Fine Mechanics Institute of the Chinese Academy of Sciences: "The Pulsed Xenon Ion Laser." This article was received on 20 February 1980]

[Text] Abstract This article reports on a small pulsed Xe ion laser. The peak power of the laser is 150 watts, 10 oscillating spectral lines are found in the 4300 to 6300 angstrom range, the pulse width of the laser is 0.2 to 1 microsecond, the discharge voltage is 4 to 12 kilovolts, the gas pressure is 0.1 to 9 millitorr.

Structure of the Device

The experimental device is shown in Figure 1.

The laser is 1600 millimeters long, discharge length is 1100 millimeters, the diameter is 3.8 millimeters, the gas chamber is 1000 millimeters long, the diameter is 15 millimeters.

Because the pressure of Xe gas is unstable, it will affect the stability of the output power. Instability of pressure is caused by two reasons. One is the gaseous pump effect which forms a gas pressure difference at the two ends of the laser tube. This difference in gas pressure can be approximated as(1)

$$\Delta P = 6.7 \times 10^{-10} \, PIT fL(D)^{-3}$$

where P is the pressure of the gas in the tube, I is the peak electric current, T is the electric current pulse width, f is the repetition frequency, L, D are respectively the length and diameter of the laser tube. We know that appropriately shortening the tube and increasing the diameter of the tube are good for stable discharge. The second is the absorption of Xe gas by overheating and gasification of the quartz tube and the cathode. We have used the gas storage device to stabilize the pressure of the Xe gas.

This type of laser needs a higher discharge electron density(2), the typical numerical value surpasses 10^{13} /centimeter^3. First we used a molybdenum tube cathode of ϕ 20 x 20 millimeters, although laser output was obtained, but the

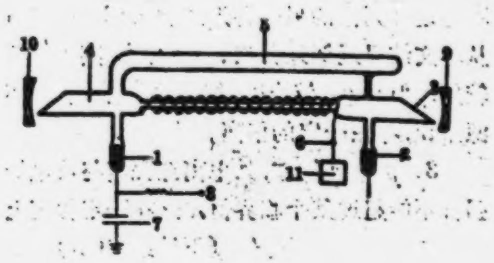


Figure 1. Pulsed Xe ion laser

Key:

1. Cathode
2. Anode
3. Brewster window
4. Laser
5. Gas storage
6. Trigger filament
7. Capacitor
8. Resistor
9. Cavity mirror with a penetration of 12%
10. Aluminum plated fully reflective mirror
11. Trigger power source

discharge voltage was high. Therefore, we used a cold cathode of pure metallic indium(3). The electric current density which this type of electrode bears surpasses 2000 ampere/centimeter^2. Metallic indium that was 99.999% pure was melted in air and then sealed around the tungsten rode electrode and we carefully avoided air bubbles from entering the indium. During the course of melting indium, the oxide surface formed was not specially treated.

The demand for purity of the gas is also high. Therefore, the system requires a vacuum as high as 10^{-6} torr, and during the course of filling gas, a molecular sieve is used to effectively adsorb vapor and other impure gases. At the same time, discharge treatment of He gas and Xe gas in the discharge tube is also carried out.

The radius of curvature of the cavity mirror is 4000 millimeters, the phase distance is 1700 millimeters. At one end is an aluminum plated fully reflecting mirror. The other end is plated with a multi-layered media film, the penetration is 12%.

The voltage of the power supply is 4 to 12 kilovolts, the discharge capacitance is 0.28 microfaraday, the laser pulse width is 0.2 to 1 microsecond, the peak pulse power is 150 watts.

At present, this laser can continue to operate over 10^4 times after one filling of gas and no visible energy attenuation is observed.

Output Characteristics

1. Laser Spectral Line

The Xe ion laser's energy level structure determines that there will be many oscillating spectral lines. The arrangement of the basic state electrons of the Xe atom is $5P^6$, when undergoing electron collision, the following two types of jumps occur:

$$5P^6 + e \longrightarrow 5P^5\ ms + e$$

$$5P^6 + e \longrightarrow 5P^5\ md + e$$

Here, $m = n + 1, n + 2, n + 3, \ldots, n = 5$.

We used the WDS-1 model monochromatograph and measured the oscillating spectral lines in the visible light range. Because the central wavelength and the reflection of the reflecting mirror are not the same, 10 different laser oscillating spectral lines were found, for details see Table 1.

It can be seen from Table 1 that when the central wavelength of the reflecting mirror varies from 4300 angstroms to 6300 angstroms, the spectral lines that oscillate most easily are the 5956 angstroms (orange red), 5260 angstroms and 5359 angstroms (two green lines) lines.

Table 1. Relationship between the central wavelength of the reflecting mirror and the oscillating spectral lines

Central wavelength of the reflecting mirror (Å)	Oscillating spectral line (Å)
4300	5359, 5260, 5044, 4954, 4306
5300	5956, 5359, 5353, 5260, 5190, 5044, 4954
5900	5956, 5359, 5260
6300	6270, 5956, 5600, 5359, 4954

Especially worth pointing out is that when the central wavelength of the reflecting mirror is 5900 angstroms, under a gas pressure of 3 to 9 millitorr, within the voltage of 6 to 10 kilovolts, there is only one orange red line of 5956 angstroms. But, when the reflection of the cavity mirror is very low, oscillation is also produced(4). Utilizing this characteristic in the laboratory, it can be suitably used as the light source of monochromatic pulse.

When the central wavelength of the reflecting mirror is 6300 angstroms, we fix the voltage at 9 kilovolts and change the gas pressure. We can see that when the gas pressure is 8 millitorr, the three spectral lines of 6270 angstroms, 5956 angstroms, 5600 angstroms occur. When the gas pressure drops to 6 millitorr, besides the three spectral lines mentioned above, a jump to the 5359 angstroms line which is shorter than the 5600 angstroms line occurs. When the gas pressure continues to drop to 3 millitorr, the long wavelength of 6270 angstroms disappears, and an oscillating 4954 angstroms line which is even shorter than 5359 angstroms appears.

When the gas pressure is fixed at 6 millitorr, changing the voltage will also cause a change in the oscillating wavelengths. When the voltage is 7 kilovolts, the four spectral lines of 5956 angstroms, 5600 angstroms, 5359 angstroms, 5260 angstroms appear. When the voltage rises to 9 kilovolts, oscillation moves towards the short wavelengths, and the 4600 angstroms line (purple light) appears.

It can be seen from the above experiment that the jumping wavelength changes with voltage and gas pressure$^{(2)}$. The lower the gas pressure, the higher the voltage, the more easily short wavelength oscillations occur.

2. Pulse Energy

In the experiment, we used the calibrated calorimeter and measured the output energy of the single pulse to be 0.6 millijoules/pulse. At the same time, we measured the effect of the discharge voltage and the filling gas pressure upon the output energy.

a. The relationship between the discharge voltage and the pulse energy is shown in Figure 2.

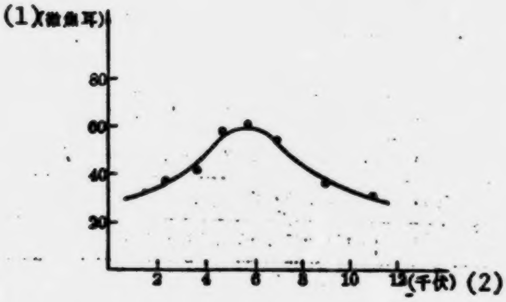


Figure 2. Relationship between discharge voltage and pulse energy

Key:
1. Microjoules
2. Kilovolts

It can be seen from Figure 2 that when the discharge voltage surpasses the threshold value, the pulse energy increases as the voltage increases, when the energy increases to a certain maximum value, as the voltage rises, the energy gradually drops. In the experiment, we kept the gas pressure unchanged at 2 millitorr, therefore as the discharge voltage increased, the value of E/P increased. The best E/P value we obtained was 2.5×10^4 volt/centimeter·torr. Continued increase in the discharge voltage caused the laser to deviate from the best E/P value, therefore the pulse energy dropped.

b. The relationship between the operating gas pressure and the pulse energy is shown in Figure 3.

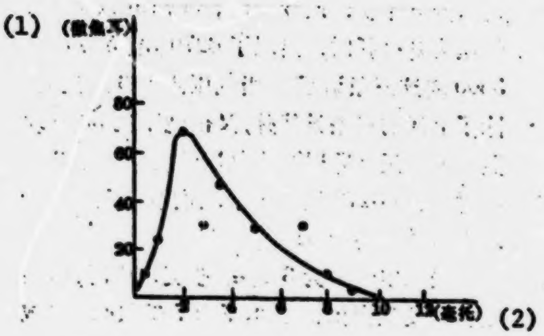


Figure 3. Relationship between operating gas pressure and pulse energy

Key:
1. Microjoules
2. Microtorr

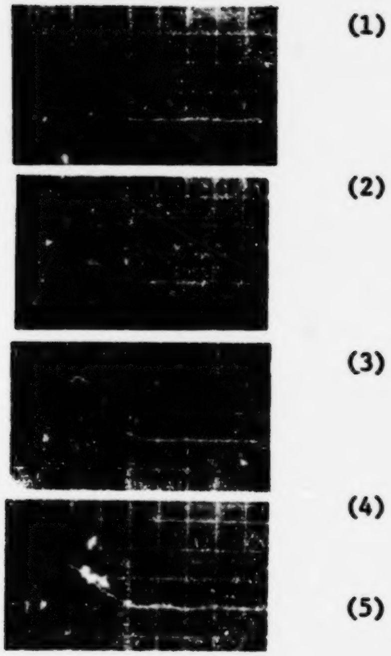
It can be seen from Figure 3 that when the voltage is fixed, after the gas pressure in the tube surpasses the threshold value, the pulse energy increases rather quickly as the gas pressure increases. When the energy increases to a certain maximum value, continued increase in gas pressure will cause the laser output to drop relatively quickly.

When the voltage is fixed and as long as the average electron energy is sufficiently high, after the gas pressure surpasses a threshold value, as the gas pressure increases, the number of particles in the excited state produced by ionization becomes larger, therefore the output of the laser also becomes larger. But the result of an overly high gas pressure is that the chance of collision of particles increases, the free range reduces, the average electron temperature drops, therefore the pulse energy drops.

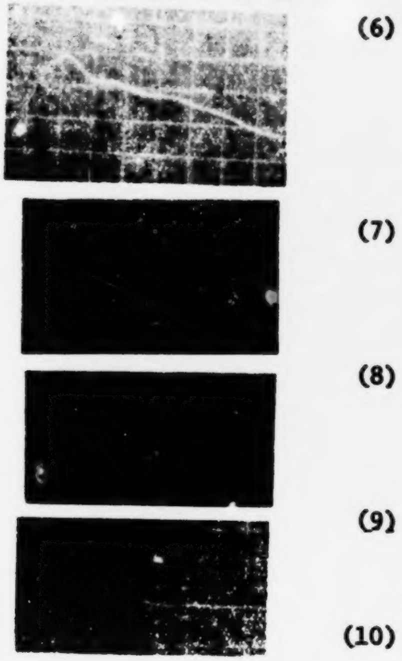
3. Laser Pulse

a. Changes in pulse width with gas pressure

The oscillographic photos of the changes in pulse width with gas pressure are shown in Figure 4.



(a) 实验条件: 固定电压为6千伏
0.2微秒/厘米, 20毫伏/厘



Key:
1. 4 millitorr
2. 3.5 millitorr
3. 2 millitorr
4. 1.2 millitorr
5. (a) Experimental condition: fixed voltage of 6 kilovolts, oscilloscope 0.2 microsecond/centimeter, 20 millivolt/centimeter
6. 5.5 millitorr
7. 4 millitorr
8. 3 millitorr
9. 1.8 millitorr
10. (b) Experimental condition: fixed voltage of 10 kilovolt, oscilloscope 0.2 microsecond/centimeter, 20 millivolts/centimeter

Figure 4. Oscillographic photos of the relationship between gas pressure and pulse width

The curve showing the relationship between the pulse width and the gas pressure is shown in Figure 5.

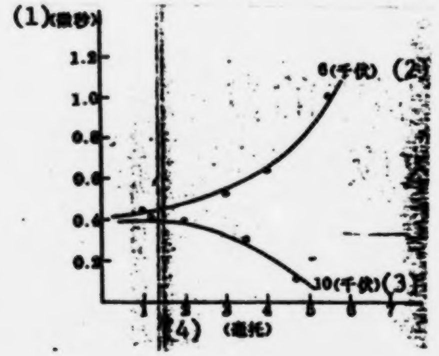


Figure 5. Relationship between pulse width and gas pressure

Key:

1. Microsecond
2. 6 (kilovolt)
3. 10 (kilovolt)
4. Millitorr

It can be seen from Figure 5 that when the discharge voltage is slightly higher than the threshold voltage (about 6 kilovolts), as the gas pressure rises, the pulse width increases, and when the voltage increases to 10 kilovolts, the exact reverse change occurs, i.e., as the gas pressure rises, the pulse width becomes narrow.

b. The relationship between the pulse width and the excitation voltage is shown in Figure 6.

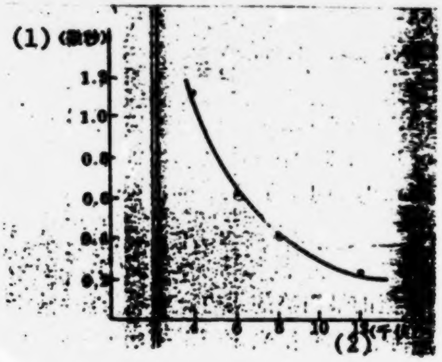


Figure 6. Relationship between pulse width and excitation voltage

Key:

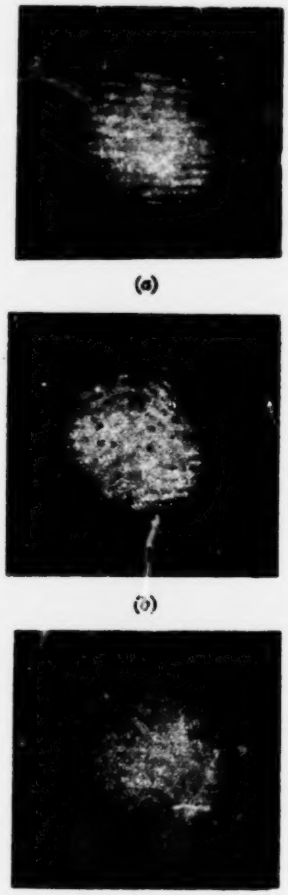
1. Microsecond
2. 12 (kilovolts)

It can be seen from Figure 6 that the laser pulse width becomes narrow as the discharge voltage rises(5).

The above is a description of the characteristics of the pulsed Xe ion laser. One of the uses of this type of laser is to serve as the pump source of the dye laser. Because the pumping line of the ion laser is close to the maximum absorption line of the dye laser, therefore the pumping efficiency is higher.

In addition, in the laboratory, we can regard the pulsed Xe ion laser as a coherent light source to study the discharge evenness in the temperature field, the flow field and plasma.

Figure 7 shows the interference in the temperature field of a flame photographed by the Mach-Zehnder interferometer using the Xe ion laser.



(a)

(b)

(c)

Figure 7.

(a) Photograph showing interference when there is no flame; (b), (c) Changes in the lines of interference caused by temperature distribution when a flame is placed in the light path.

References

(1) Clinton D.H., Rev. Sci. Instrum., 1974, 45, 400.

(2) Bridges W.B., Appl. Phys. Lett., 1964, 4, 178.

(3) Simmons W.W., IEEE J. Q. E., 1970, QE-6, 649.

(4) Willian W.S., IEEE J. Q. E., 1970, QE-6, 466.

(5) Bridges W.B., Appl. Opt., 1965, 4, 573.

9296
CSO: 4008/421

APPLIED SCIENCES

CHARACTERISTICS OF PULSED GOLD VAPOR LASER OUTLINED

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 45-46

[Article by Zhang Guiyan [1728 2710 3601], Liang Baogeng [2733 1405 2704], Jing Chunyang [2529 2504 7122], Yin Xianhua [1438 2009 5478], Ye Yanjie [5509 1693 3381], Cang Yongqing [0221 3057 3237] of the Shanghai Optics and Fine Mechanics Institute of the Chinese Academy of Sciences: "Pulsed Gold Vapor Laser." This article was received on 25 July 1980]

[Text] At present, metallic vapor lasers are an active field. Several dozen laser oscillating spectral lines have been found within the very broad spectral wavelengths from infrared to ultraviolet. We have carried out laser studies of gold vapor on the basis of copper vapor laser studies and obtained a pulsed laser of gold atoms of an operating wavelength of 6278 angstroms.

I. Experimental Setup

The characteristic of the gold vapor laser is that it can operate in high temperatures and highly repetitive frequency pulses. The experimental setup includes a gas discharge tube of special structure, a highly repetitive frequency pulse excitation power source, an optical harmonic oscillation cavity and a checking system, as illustrated in Figure 1. The special gas discharge tube is made of a quartz tube of ϕ_{inner} 12 x 300 millimeters, the inner lining is a transparent oxidized aluminum porcelain tube of ϕ_{inner} 8 x 260 millimeters. The outer casing is a fused quartz thermal insulation case of ϕ_{outer} 30 millimeters. In the sandwiched layer is a thin multilayer molybdenum plate serving as an insulating layer. Inside the thermal insulation case is a vacuum. The two ends of the discharge tube are optical quartz windows. The plane of the windows is slanted at a 3° inclination away from the perpendicular direction of the light axis. On the two ends of the discharge tube are pure tungsten rod electrodes of ϕ 6 x 50 millimeters vacuum cealed onto the tube by molybdenum plates, the distance between the electrodes is 290 millimeters. The structure of the discharge tube is shown in Figure 2. The vacuum in the tube is 2×10^{-4} torr, neon buffer gas of 26.5 torr fills the tube and spectrographically pure gold powder of 5 grams are placed in the tube. It needs to be especially pointed out that the buffer gas induces discharge and propagation of energy, it can also slow the diffusion of the metallic vapor towards the two ends of the discharge tube and serves definitely to protect the optical windows. The optical harmonic oscillation cavity consists of a totally reflective film with a curvature radius of 3 meters and an optical plate with a penetration of 19%. The length of the cavity is 755 millimeters. The multiple repetitive frequency pulse excitation power source is a Blumlein harmonic charge circuit triggered alternately by the pulse thyratron. The high temperature of the discharge tube is sustained by self heading during discharge, temperature measurement is done by the use of a platinum-platinum rhodium thermal coupler in the thermal insulation layer combined with the 902 model automatic temperature controler.

Under our experimental conditions, the power supply voltage was 3750 volts, the charge inductance was 0.4 henry, the capacitance was 2 microfaraday, the repetitive frequency of the pulse was 16 kilocycles, the light emission occurred 30 minutes after discharge, maximum output occurred about 10 minutes afterwards, and the device operated in a stable manner.

II. Experimental Results

In the experimental device described above, we obtained a 6278-angstrom pulsed laser with an average output power of 35 milliwatts, operating in a stable fashion for 7.5 hours. We used a combination of the 1P-21 photoelectric multiplier and a WDS-J2 model circular disc monochromatograph and measured the maximum half width of the laser pulse to be 32 millimicroseconds. We used the WPG-100 model plane grid spectrograph and photographed the emitting spectrum of the gold vapor laser and carried out wavelength calibration using the double line of the sodium spectrum and the He-Ne laser spectral line as control source, see Figure 3.

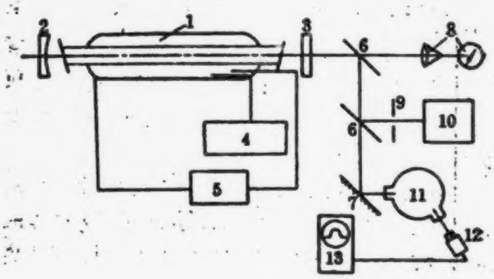


Figure 1. Experimental setup of the pulsed gold vapor laser

Key:

1. Discharge chamber
2. Fully reflective medium film
3. Partially reflective medium film
4. Temperature measurement
5. High frequency pulse excitation power source
6. Spectrometric plate
7. Fully reflective film
8. Power measurement
9. Small aperture stop
10. Spectroscope
11. Monochromatograph
12. Photoelectric multiplier
13. Oscilloscope

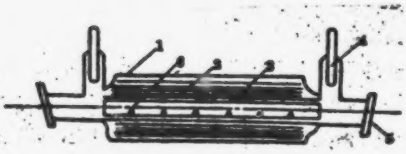


Figure 2. Structure of the discharge tube

Key:

1. Fused quartz outer shell
2. Molybdenum plate thermal insulation layer
3. Porcelain lining tube
4. Tungsten rod electrode
5. Quartz window
6. Pure gold

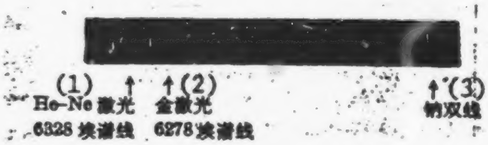


Figure 3. Gold vapor laser emission spectral lines

Key:

1. He-Ne laser
   6328 angstrom spectral line
2. Gold laser
   6278 angstrom spectral line
3. Sodium double line

References

(1) S.V. Markova, G.G. Petrash, Sov. J. Quant. Electr., 1978, 8, No 7, 904-906.

9296
CSO: 4008/422

APPLIED SCIENCES

LASER TRIGGERED SPARK GAPS UNDER EXPERIMENTAL STUDY

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 46-47

[Article by Meng Shaoxian [1322 4801 6343], Pu Chaoshun [3184 2600 7311], Yang Yi [2799 5030], Sun Naigeng [1327 0035 1649], Xie Ziming [6200 2737 6900] of the Shanghai Optics and Fine Mechanics Institute of the Chinese Academy of Sciences: "Experimental Study of Laser Triggered Spark Gaps." This article was received on 21 December 1979]

[Text] Laser triggered spark gaps(1) are an important component for the selection of singular ultrashort pulses from the locked mode pulsed laser and for shearing of laser waveforms by the photoelectric switch.

We first experimented with the copper sphere gap. It consists of two copper spheres of ϕ 20 millimeters. The multiple voltage rectified high voltage is passed through a 75 ohm electrical cable which is connected to the spheres. When the locked mode laser passes through the short focal distance lens and focuses on the gap between the copper spheres, an air puncture is formed producing initial electrons and ions. These electrons and ions move towards the two electrodes under the effects of the electrical field of the gap between the spheres, thus forming a puncture in the gap between the spheres.

To measure the discharge waveform in the gap between the spheres, we used the T type four terminal network attenuator connected to an OK-19 high voltage oscilloscope for photographing, the sensitivity of the oscilloscope was 280 volts/centimeter, the rising time was 2.25 millimicroseconds, the clock marked a gap of 10 millimicroseconds between peaks of the wave.

The fore of the waveform of the switch discharge in the gap between copper spheres is longer, when a 20,000-volt voltage is added to the gap between the spheres, the distance of the gap between the spheres is 6 millimeters, but when the humidity of air is large, the distance should be appropriately lengthened. We used a formed electrical cable of 1 meter long. The photographed waveform in the gap between the spheres is shown in Figure 1. Using the 75 ohm electrical cable, the rising time in the gap between the spheres is 7 millimicroseconds. The gap between copper spheres is generally not too stable, when the humidity of air changes, the puncturing voltage will change.

Figure 1. Discharge waveform in the gap between copper spheres (distance between peaks of the wave is 10 millimicroseconds)

To obtain a spark gap with a faster rising time requires a reduction of the distance between the two electrodes of the spark gap. This means that a medium of good insulating properties must be added between the two electrodes of the spark gap.

According to Paschen's empirical curve, we conducted a spark gap experiment using xenon filled low pressure glass, the filling gas pressure was 10^{-3} to 10^{-4} torr.

We discovered in the experiment that, for this type of spark gap, when the voltage is relatively high, puncturing does not occur at the closest distance to the electrode but long distance discharge is formed and a so-called "long range effect"(2) occurs, affecting the rising time of the spark gap. In addition, this type of spark gap is unstable, after several discharges, because the electrodes release gas, the puncture voltage is changed.

For this, we conducted a spark gap experiment using high gas pressure silicon dioxide glass. For high gas pressure, we used liquid nitrogen to make cold krypton gas and injected it into the silicon dioxide tube and then changed it back to a gas. The distance between the electrodes of this type of spark gap can be very close, the experimental curve is shown in Figure 2. It can be seen from the diagram that when the distance between the electrode is fixed, the increase in gas pressure will cause a corresponding increase in puncture voltage.

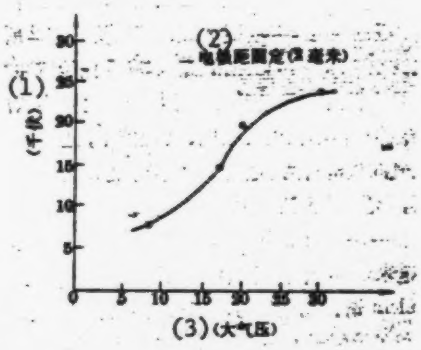


Figure 2. Relationship between puncture voltage and gas pressure

Key:

1. Kilovolt
2. Fixed distance between electrodes (2 millimeters)
3. Atmospheric pressure

This type of spark gap also has a definite shortcoming. When using a short focal distance lens to focus the laser to puncture the spark gap, the quartz tube wall cannot bear the radiation of the laser, and also, the gas pressure cannot be easily controlled, and the distance between the electrodes cannot be adjusted.

Later we used a spark gap with a metallic chamber of high gas pressure with an adjustable distance between the electrodes and an adjustable gas pressure. This kind of a device uses stainless steel as electrodes, its escape power is larger, and at the same time, it does not easily react with the filling gas. We selected nitrogen gas, the gas pressure was 20 atmospheric units, for laser focusing, we used the 1:5 lens, the focal distance was 10 centimeters. When the spark gap and the Pockels cell switch are connected, the discharge waveform produced by using a locked mode laser to puncture the spark gap is shown in Figure 3.

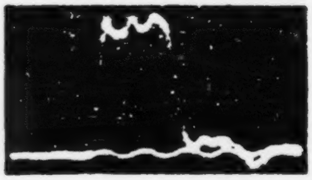


Figure 3. Discharge waveform of a high voltage spark gap

At this time, the capacity of the KDP crystal of the Pockels cell is 5 micromicrofaraday, the characteristic impedance of the electrical cable is 75 ohms, the distance between the electrodes is 0.8 millimeter, the voltage is 23,000 volts, the rising time measured is 1.6 millimicrosecond. If a low electrical resistance cable is used, the rising time will be even faster. In Figure 3, the fluctuation of the voltage is mainly caused by the incomplete matching of the dynamic resistance and impedance of the spark gap.

In addition, we also conducted an experiment of the gap between spheres using a solid medium--polytetrafluoroethylene plastic as the insulating material. This type of medium can have a higher tolerance to voltage but it easily allows electrical creeping about the medium, the puncture voltage is affected by the cleanliness of the medium, and after each puncture, branch like patterns appear on the medium and it cannot be used further.

We also conducted experiments of the gap between spheres using transformer oil as the insulating material. Its insulation is not too good, during each puncture, gas bubbles emerge from the oil, and the insulation of the medium also changes gradually. The principles for each gap between spheres we used are illustrated in Figures 4 and 5.

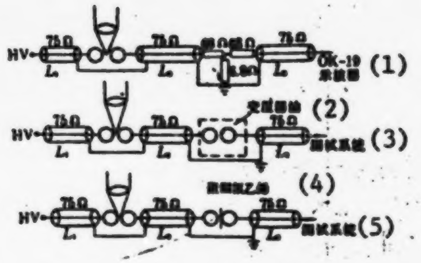


Figure 4. Several types of pulse forming circuits in the gap between copper spheres

Key:

1. Oscilloscope
2. Transformer oil
3. Testing system
4. Polytetrafluoroethylene
5. Testing system

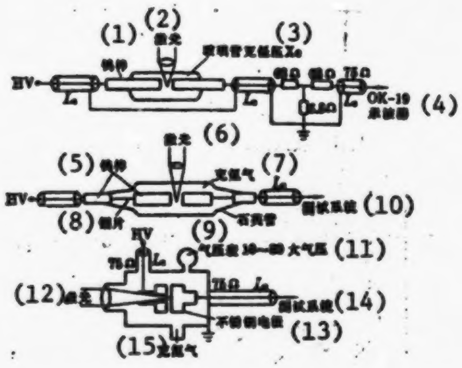


Figure 5. Various types of gas filled gaps between spheres

Key:

1. Tungsten rod
2. Laser
3. Glass tube filled with low pressure Xe
4. Oscilloscope
5. Tungsten rod
6. Laser
7. Filled with krypton gas
8. Molybdenum plate
9. Quartz tube
10. Testing system
11. Gass pressure gauge 10-30 atmospheric pressure
12. Laser
13. Stainless steel electrode
14. Testing system
15. Filled with nitrogen gas

References

(1) A. H. Guenther, Proc. IEEE, 1971, 59, No 4, 689.
(2) Steinmetz, Rev. Sci. Instrum., 1968, 39, 904.

9296
CSO: 4008/422

APPLIED SCIENCES

OPTIC-ACOUSTIC CO_2 LASER SPECTROMETER USED TO ANALYZE, TEST GASES

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 4, Apr 81 pp 52-53

[Article by Chen Chuanwen [7115 0278 2429], Liu Yaotian [0491 5069 3944], Ming Changjiang [3494 7022 3068], Wang Cai [3769 2088], Wang Wenyun [3769 2429 7301], Xu Jun [1776 0193], Li Zhenxiang [2621 2182 4382], Wang Lianjie [3769 6647 2638] of the Changchun Applied Chemistry Institute of the Chinese Academy of Sciences: "Development of the Optic-Acoustic CO_2 Laser Spectrometer." This article was received on 14 July 1980]

[Text] We developed an Optic-Acoustic CO_2 laser spectrometer and used it to analyze and test certain gases such as ethylene and ammonia and obtained the optic-acoustic spectrogram by automatic scanning within the range of the CO_2 emitting spectral lines. The following introduces its structure and function.

Principle and Structural Characteristics

The infrared optic-acoustic testing principle of gaseous samples has been described in detail in past reports(1). Generally speaking, in a sealed optic-acoustic pool, when a gaseous sample is radiated by a modulated light, the light of this wavelength is absorbed by the sample, the thermal motion of the molecules of the gas increases, this is manifested by a periodic wave motion of the temperature inside the pool at the modulated frequency of the incident light, the pressure inside the pool expands and contracts periodically, and a microphone is used to receive the sound frequency pressure signal, and then a locked magnifier is used to detect useful optic-acoustic signals buried in the noise, thus obtaining the optic-acoustic spectrogram of the sample.

The principle and structure of the device is illustrated in Figure 1. The main structures are:

(1) Light source: An extra-cavity tuned CO_2 laser is used as the light source. The range of rotation of the light grid rotary platform is ±5°, satisfying the requirements of all branch lines of the 00°1 to 10°0 and 00°1 to 02°0 jumps for the azimuth. The laser has 70 to 79 tunable spectral lines, the distribution of its spectral lines are illustrated in Figure 2 and Figure 3.

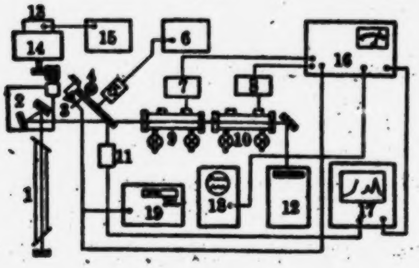


Figure 1. Principle and structure of the optic-acoustic laser spectrometer

Key:

1. CO_2 laser
2. Light grid rotary platform
3. Silicon photoelectric cell
4. Small light bulb
5. Stepwise electric motor
6. Power source of the crystalline stable frequency shearing device

7, 8. Front circuit of the optic-acoustic cell and attenuator

9, 10. Optic-acoustic cell B, A

11. Power meter probe
12. CO_2 laser spectral line analyzer
13. Reversible electric motor
14. Transmission box
15. Scanning circuit controler
16. Locked magnifier
17. x, y function recorder
18. Double line oscilloscope
19. Numerical frequency counter

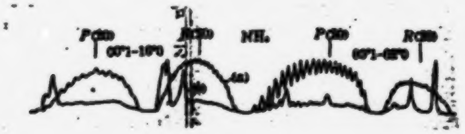


Figure 2. Optic-acoustic spectrogram of ammonia sample (b) and CO_2 laser power spectrogram (a)

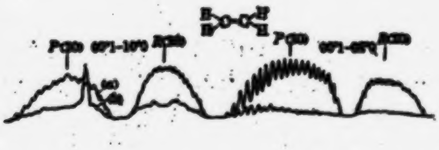


Figure 3. Optic-acoustic spectrogram of ethylene sample (b) and CO_2 laser power spectrogram (a)

(2) Spectral line (wavelength) scanning system: It can be seen from Figure 1 that the scanning system is composed of a long gear and a reversible electric motor attached to the filament rod cap of the light grid rotary platform and fitted to the output gear of the transmission box and a control device. The transmission box can operate in three scanning speeds, 1, 2, and 4 revolutions per minute. The transmission box has a finite switch limiting the light grid to move within an area of rotation of 9 to 11 micrometers, the controler of the reversible electric motor has several shifts of control for positive revolution, reverse revolution, and instant stop and start.

(3) Modulation of the stable frequency of the laser beam: Because the locked magnifier's frequency selection channel requires precision in frequency, when using the synchronous electric motor or the ordinary alternating current electric motor powered by the city's electric power supply for light shearing, the modulated frequency will fluctuate with the city's electrical frequency, if the locked magnifier's frequency selection channel is not adjusted constantly, the output signal will be unstable. For this, we used the quartz crystal stable frequency light shearing device. Its main structure consists of the 96 kilocycle quartz oscillator driving a stepwise electric motor through frequency demultiplication, pulse formation, and power release to lead the light shearing plate for modulation, and a highly stable modulated frequency is obtained.

(4) Monitoring the laser's spectral line: We used the commercial CO_2 laser spectral line analyser to monitor and measure the wavelength of the laser's spectral lines. During the course of scanning, one or two spectral lines are measured on each branch, the others are computed according to the jumping patterns of CO_2.

(5) Detecting and measuring the optic-acoustic cell and the optic-acoustic signals: Introduction to the work in this regard has been described in detail in previous reports(2). The microphone in the optic-acoustic cells A and B must be strictly selected so that the sensitivity, frequency response and base noise must be consistent. Where there is no sample, adjustment of the attenuator can be made so that the optic-acoustic signal of cell A minus cell B equals zero.

Performance of the Device

To prove the correctness of the optic-acoustic spectrogram of the sample measured by the instrument, we selected ethylene and ammonia as the calibrated operating material. Figure 3 shows the optic-acoustic spectrogram of ethylene and the CO_2 laser power spectrogram. Ethylene has a stronger absorption peak at P(14) in the 00° 1 to 10° 0 jump, and a second stronger absorption peak at R(24). (In the diagram, the power spectrum's P(14) peak and the P(14) peak of the sample are at a distance and cannot completely overlap because the x, y recorder's y_1 and y_2 strokes are at a distance apart).

Figure 2 is the optic-acoustic spectrograph of the ammonia sample and the CO_2 laser power spectrogram. Ammonia has relatively strong absorption peaks at P(34), P(32), R(6), R(8), R(14) in the 00° 1 to 10° 0 jump and at P(20), P(34), R(16), R(30) in the 00° 1 to 02° 0 jump. The above spectrograms are all consistent with the reports in reference (1), to examine the quantitative test performance level of the device, we used ethylene as an example to carry out an experiment, when the sample amount was of a low concentration i.e. 0.05 to 1 ppm, repeatable data were obtained. When the sample amount was of high concentration, i.e., 10 to 100 ppm, repetitively stable data were obtained in ten repetitions. A large amount of experimental results show that the sensitivity of this device, i.e., the smallest detectable concentration of ethylene is 0.05 ppm (10^{-8}). When the concentration of the sample is 1 ppm, the greatest deviation of detection is ±20%, the average deviation is ±5%. When the sample amount is 50 ppm, the largest deviation is ±10%, the average deviation is ±20%.

References

(1) R.J. Brewer, C.W. Bruce, Appl. Opt., 1978, 17, 3748.

(2) Chen Chuangwen [7115 0278 2429] et al, LASER, 1980, 7, No 9, 48-51.

9296
CSO: 4008/422

BRIEFS

MICROCOMPUTER FAIR--Beijing, 3 Aug (XINHUA)--A fair to exchange applied technology for microcomputers sponsored by the Hong Kong Jingye Company, the Beijing Economic Construction Company, the Beijing Engineering University and the Institute of Acoustics of China's Academy of Sciences opened in Beijing on 3 August. At the fair, which was scheduled to last 7 days, various microcomputers manufactured abroad were displayed, including the single-board microcomputer model TP-801 jointly designed by the Hong Kong Jingye Company and the Beijing Engineering University. This type of multipurpose microcomputer can be used in teaching, scientific research and industrial and agricultural production. [Beijing XINHUA Domestic Service in Chinese 1532 GMT 3 Aug 81]

CSO: 4008/455

PUBLICATIONS

TABLE OF CONTENTS OF 'DADIANJI JISHU' NO 3, 1981

Harbin DADIANJI JISHU [LARGE ELECTRIC MACHINERY TECHNOLOGY] in Chinese No 3, 1981 preceding p 1

[Text] Analysis or Calculations for Some Design and Operation Problems of Turbo-generators (Part 1)......Miao Changming [4924 2490 2494], Testing Institute, Guangdong Electric Power Bureau (1)

Determination of Fractional-slot Winding Group Sequence Having Non-60° Phase Belt and Its Application to Electric Machine Design......Ye Shounian [5509 1108 1628], Hangzhou Power Generating Equipment Plant (8)

The Ventilation Improvement of the Hydrogenerator TS 1350/135-96 at Fuchunjiang Water Power Station......Jiang Deqing [1203 1795 3237], Jiangshui Power Plant, Fuchun; Fan Yongda [5400 3057 6671], Harbin Large Electrical Machinery Research Institute (15)

The Design Problems of Large Power High-speed Squirrel-cage Asynchronous Motors......Yan Shu [6768 1659], Shenyang Electrical Machinery Plant (19)

Inquisition on Machining and Fitting Technology of the Retaining Ring Periphery Before the Final Machining......Zhou Guangquan [0719 0342 3123], Dongfang Electrical Machinery Plant (25)

Calculating Numerically an Electrical Field in Multi-stage Silicon-carbide Coating for Protecting AC Machine Stator and Winding from Corona--By Runge-Kutta's and Neuton's Methods ......Liu Shangchun [0491 0006 2797], Harbin Large Electrical Machinery Research Institute; Li Jingfu [2621 2529 1381], Harbin Power Station Equipment Design Research Institute (29)

Observation and Study of Cavitation Pitting for Kaplan Turbine Runner......Lin Shizhong [2651 0013 6945], Harbin Large Electrical Machinery Research Institute (35)

An Elementary Research on Dynamic Efficiency of Hydraulic Turbine......Shan Ying [0830 7751], Electrical Machinery Institute, Water Conservation and Hydropower Research Institute (42)

The Machining Equipment and Process of the Disk Gate...... Zhu Huanqi [2612 3562 7871], Dongfang Electrical Machinery Plant (46)

The First Experimental Two-direction Tidal-plant Being Set Up in China......Ye Zhishao [5509 4249 7300], Jinhua Hydraulic Turbine Plant (51)

General Specifications for the Automation Systems and Elements of the Large and Middle Hydropower Units......Harbin Large Electrical Machinery Research Institute (55)

9717
CSO: 4008/412

PUBLICATIONS

TABLE OF CONTENTS OF 'JIGUANG' NO 5, 1981

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 5, May 81 inside back cover

[Text]

A Continuously Tunable UV Laser in the 2800-4100 A Range......Yang Xiangchun [2799 7449 2504], Ye Lin [5509 7207] and Yang Tianlong [2799 1131 7893], all of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (1)

Active and Active-passive Mode-locked Pulsed Lasers...... Qiu Peixia [5941 0160 7209] and Tang Guichen [0781 6311 3819], both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (5)

The Three-photon Resonance Ionization of Atomic Potassium ......Tang Xiao [3282 2556], Zhang Zuren [1728 4371 0088], Li Zhaolin [2621 0340 7207] and Feng Baohua [7458 1405 5478], all of the Institute of Physics, Chinese Academy of Sciences (10)

The Electric Dipole Transition Intensity of the Nd^{3+} Ions in LNP Crystals......Wu Guangzhao [0702 0342 3564] and Zhang Xiurong [1728 4423 2837], both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (12)

The Picosecond Optical Gate......Zhao Jiran [6392 4949 3544], Gao Fuyan [7559 4395 3293] and Chen Shuqin [7115 3219 3830], et al., all of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (15)

An Electro-optic Crystal Modulator for Mode-locking of Lasers......Li Shichen [2621 0013 1820], Ni Wenjun [0242 2429 0193] and Zhou Dingwen [0719 1353 2429], all of Tianjin University (19)

A Half-tone Method for Laser Mode Detection......Dai Jianhua [2071 1696 5478] and Zhang Hongjun [1728 3163 6874], both of the Institute of Physics, Chinese Academy of Sciences (24)

Experimental Studies on Alkali-metal Pumping Lamps...... Wang Huandeng [3769 3562 3597], Qian Yulan [6929 3768 5695] and Jin Tingzhen [6855 1656 5271], et al., all of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (28)

Application of Image Plane Holography in Holographic Microscope......Xu Shenchu [1776 1957 0443] and Liu Shou [0491 1343], both of the Department of Physics, Fujian Normal University (33)

Application of Computer-generated Holograms to Asperic Surface Testing......Hu Hongzhang [5170 1347 4545] and He Shunzhong [6320 7311 1813], both of the Department of Precision Instruments, Tianjin University (37)

Science Notes

Phase Conjugation Characteristics of Backward Stimulated Brillouin Scattering Waves...... (41)

Research on the Tunable Infrared Laser System Based on Simulated Electronic Raman Scattering Effect...... (42)

Tunable Dye Laser Pumped by a Pulsed Xenon Ion Laser...... (45)

Simultaneous Pumping of Nd^{3+}:YAG Laser by CW and Pulsed Light...... (48)

A Dual Electron-beam Controlled CO$_2$ Laser...... (49)

A He-Ne Laser Tube Totally Sealed-off with Metal Glass...... (51)

Raise the Efficiency of Nd:YAG Lasers Using Composite Technology...... (52)

Generation of UV Nanosecond Light Pulse Trains by Using Blumlein Circuit...... (54)

Ultra-short Light Pulses from a Semiconductor Laser Excited by Electrical Pulses Formed by a Laser Pulse Controlled Opto-electronic Switch...... (55)

Observation of Speckle Shift Induced by Rigid-body Longitudinal Movements...... (56)

Single-block Double 45° LN Low Temperature Compensator...... (60)

Photo-acoustic Measurement of the Absorption Coefficients for some IR Window Materials at CO$_2$ Laser Wavelengths...... (60)

Application of Pulsed Ruby Laser in Front Light High Speed Ballistic Photographic System...... (62)

Letters

Progress of Laser Crystal Research by the North China Research Institute of Electro-optics in 1980...... (64)

The Fourth Science Symposium Held at the Shanghai Institute of Optics and Fine Mechanics...... (27)

9717
CSO: 4008/418

AUTHOR: CAO Bowei [2580 0130 1983]
et al.

ORG: None

TITLE: "Problems in Housing Development in Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 7, 20 Jul 81 pp 1-5

TEXT OF ENGLISH ABSTRACT: The article puts forward the following three problems in housing development in Shanghai:

1) Building Area and Standards. The authors hold that while increasing the total area of housing to be built each year, efforst should be made to maintain as many suites as possible from the same total building area. To increase the building area of each suite too early will not be favorable in solving housing problems. A better living standard can be obtained as well through other means, such as rational arrangement and more efficient use of space, improvement of interior treatment and multi-purpose furniture.

2) Land and Building Density. The urban area of Shanghai has a population density of 406 persons per hectare. In view of the shortage of usable land and high density of population, residential buildings of 5-6, 8-9 and 12-20 stories in combination should be built. Five to six storied buildings should be emphasized at present, with a gradual increase in height in the coming years. The net building area in the urban district should reach 25,000-30,000 sq m/ha.

3) Standardization and Diversification. Standardization is necessary in housing

[Continuation of JIANZHU XUEBAO No 7, 20 Jul 81]

development. In addition, systematization of typical components should be maintained to meet the demand of diversification of building forms. Diversification does not only concern outward appearance, but also plot plan arrangement, various building types and different combinations of typical units of living room, kitchen, lavatory, etc.

As an analysis of the above points, the authors have prepared alternative schemes for a built-up area for comparison.

AUTHOR: LU Guangqi [0712 0342 4388]
et al.

ORG: None

TITLE: "Planning of Housing Development in Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 7, 20 Jul 81 pp 6-9

TEXT OF ENGLISH ABSTRACT: Eight points on housing development from the viewpoint of city planning are included in the article:
1. In the planning of housing development, which is an important element in the plan of city development, an overall consideration should be given to solve the problems of living, working, studying, communication and recreation. However, housing development is a long-term task which should be adaptable to the changing conditions of the city in economy and culture. Both short-term and long-term considerations should be taken.
2. The distribution of housing development should be in accordance with that of production. The distribution of production in Shanghai is on a dispersed basis. Nine outskirt districts and six satellite towns have been developed since 1949. Four districts, including that north of Pentagon Square, are the main bases for housing development in the near future.
3. To solve the housing problem in Shanghai, organizations and inhabitants in the city center have to be dispersed to satellite towns. However, effects have not been conspicuous due to various reasons. Housing development in satellite towns

[Continuation of JIANZHU XUEBAO No 7, 20 Jul 81]

should be backed by economical, political and communicational supports.
4. The main task of housing development at present centers around extensions and new dwellings on the perimeter of built-up areas. Construction begun in 1980 will house 600,000 people when completed.
5. Rehabilitation of the old city center should be planned overall and properly arranged, adaptive to local conditions and carried out by stages and in groups.
6. Provided that the nature, capacity and distribution of production is well-handled, mixed areas of production and living can be developed. A number of such areas has already been formed in the suburbs.
7. The plan of housing units should be adapted to local conditions, with unit types meeting present requirements of allotment as well as future developments.
8. Housing development should be realized through unified administration and coordinated construction instead of having each organization build its own dwellings. Public buildings and municipal facilities should also be provided in time.

AUTHOR: WANG Dingzeng [3076 1353 3582]
et al.

ORG: None

TITLE: "Design of the Shanghai Hotel"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 7, 20 Jul 81 pp 16-22

TEXT OF ENGLISH ABSTRACT: The Shanghai Hotel under construction, with 600 twin bed rooms, has a total building area of 44,561 sq m and 26 stories above ground, occupying a lot of 1.02 ha. It is the first large hotel for tourists to be built in Shanghai since liberation.

The architects for the hotel note that the technical means by which problems in design can be solved are just as important as an imaginative artistic conception. Two major purposes are to be fulfilled in hotel design: first, the creation of a comfortable physical environment with adequate facilities, and second, a particular local atmosphere which will give tourists the impression that the trip was worthwhile. Practice in design shows that only when technical problems have been solved can the artistic conception be realized. The whole history of architecture teaches that the development of architectural forms throughout the ages has always been restricted and influenced by technique and materials. Only creative application of technique can turn out a building which is an artistic work of architecture.

[Continuation of JIANZHU XUEBAO No 7, 20 Jul 81]

Nationalistic style or local characteristics is important in hotel design. However, the realization of nationalistic style in highrise buildings is quite difficult. As the interior of a building has more contact with people, the interior design should better satisfy the human demand and expectation. It is also more practical to adopt traditional style in the interior. A strong flavor of Chinese culture can be enjoyed by foreign tourists through interior decoration, furniture and finishing. Silk Road, the ancient passage of communication between the East and West, has been chosen as the leitmotif of decoration in the hotel.

Each type of building has its own particular characteristics. The key points in highrise hotel design are economy, efficiency in space usage and fireproofing. The Shanghai Hotel has an area index of 73.3 sq m/bay, a net area of a twin bed room of 15.9 sq m, and a typical floor height of 3 m, which are on the low side amorg tourist hotels in China.

AUTHOR: TIAN Wenzhi [3944 2429 0037]
et al.

ORG: None

TITLE: "Shiliupu Passenger Station, Shanghai Port"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 7, 20 Jul 81
pp 23-29

TEXT OF ENGLISH ABSTRACT: Shiliupu Passenger Station of Shanghai Port is a large one with traffic capacity of 4,350,000 persons per year and 20,000 persons per day. The maximum passenger gathering is 5,832 persons, the area of waiting space 6000 sq m, and the total building area 35,000 sq m.

To separate passenger and goods traffic, Dada Passenger Station in the southern part of Shiliupu, formerly used for inland water traffic, has been turned into a station exclusively for goods, while Shiliupu Station is kept exclusively for passengers.

The station is parallel to the coast line and as near to the berth as possible, leaving more space at the front for approaching. The waiting rooms, ticket office, check room, dispatching office, general office and control room are placed in separate buildings incorporated into a whole with the Passenger Station Building as the major structure. The waiting rooms for different cabins and destinations occupy two floors and include escalators.

[Continuation of JIANZHU XUEBAO No 7, 20 Jul 81]

The building, located at the end of the skyline at the Bund, is the first large public building to be built there after liberation. The architectural treatment, with the dispatching tower and overhead gallery as accents, emphasizes openness and light without affectations.

AUTHOR: FENG Jizhong [7458 4764 1813]

ORG: None

TITLE: "The Garden of the Square Pagoda"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 7, 20 Jul 81 pp 40-45

TEXT OF ENGLISH ABSTRACT: In the southeastern part of Songjiang, a town within the municipality of Shanghai and about 30 km from the city center, there are three historical relics: a square pagoda of the Song Dynasty which has stood for some 900 years, a nearby screen wall of the Ming Dynasty decorated with brick carvings, and a stone bridge farther away also of the Song. A new garden has been planned to enclose these relics as centers of interest together with the existing old trees and bamboo groves. The garden will have an area of about 11 hectares. In addition to the above-mentioned relics, a temple hall of the Ming Dynasty will be moved from some other location to the garden.

The three relics belong to different ages and bear no relation to one another in space. Any attempt to organize them into a whole by incorporating them with new architectural features would result in failure. Therefore, a free plan has been determined that will keep them as they are, emphasizing the relics themselves as centers of interest. Only terraces, courts, walls, rockeries and ponds are designed to serve as background and means of incorporation. The composition is

[Continuation of JIANZHU XUEBAO No 7, 20 Jul 81]

loose, but not disconnected. The treatment is intended to be refined and simple, recalling the architectural style of the Song.

The ground where the pagoda stands is lower than that of the surrounding area. To eliminate the sunken effect, it is to be enclosed by walls that will form a court, so that the base of the pagoda will not be visible from outside. To give apparent height to the pagoda, the ground outside the court in the eastern approach will wind up and down with steps. No trees or bushes are to be planted in the courtyard, thus giving a sense of solemnity and dominance to the center of interest. Two approaches to the pagoda are designed, a straight one from the north and a winding one among the bamboo groves from the east.

Since the town was called Antler City in ancient times, deer ground is to be provided in the south lawn which slopes down to the water and where maples are to be planted.

The tradition of the Chinese garden still finds its vitality in modern landscape architecture. In order to inherit this tradition, we must comprehend the philosophy, go deep into its ingenuity and absorb its essence. The present day's needs by the large masses could not be met simply by enlarging the dimensions. Foreign experiences in gardening should also be appropriately absorbed. For example, the use of a lawn and the selection of the species of tree as the theme, both to harmonize the whole garden, have been absorbed in its design.

9717
CSO: 4009/439

AUTHOR: None

ORG: Design Department, Fushun Excavator Manufacturing Plant

TITLE: "WD-122 Single Bucket Excavator"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 7, 81 pp 1-5

ABSTRACT: The Fushun Excavator Manufacturing Plant most recently succeeded in obtaining the State's certification for its WD-122 excavator. It is, at present, the excavator with a bucket of the largest capacity in China. From Mar 78 to Oct 80, the machine underwent industrial testing at the Anshan Dagushan Iron Mine. Ores weighing 973,000 tons were dug. The machine was in operation continuously for 1821 hours and moved 5.43 km. If transportation vehicles are reasonably coordinated, it can excavate and move 20-30 thousand tons of ore a day, with an average annual productivity of 7,000,000 - 10,000,000 tons. The steel cable averages a useful life of 800,000-1,200,000 tons/piece. Compared with foreign advanced makes, its shortcoming is the thin lubricant used in the speed reducer. Some foreign products now use dry lubricant so that there is no problem of leakage and the cogs of the gears may last longer. At present, the major subject under study in China with respect to excavator manufacturing is the use of silicon controlled power supply.

AUTHOR: XIONG Guoxiang [3574 0948 5046]

ORG: Kunming Municipal Construction Machinery Repair Shop; Kunming College of Engineering

TITLE: "JJKX-1 Fast Winch for Construction Use"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 7, 81 pp 5-6

ABSTRACT: The Kunming Municipal Construction Machinery Repair Shop and the Kunming College of Engineering jointly designed and made the JJKX-1 one ton model fast winch for construction use. The prototype underwent 500 hours of industrial testing and fatigue test. In 1980, it was certified. Its major parameters and parts are described, including a photo of the machine. In a table, its parameters are compared with those of similar machines, including the T224-B of the USSR, the KW-10 of Japan, the KUSW-10 of Japan, the TJ-10 of China, the JJK-1 of China, and the JJKX-1 of China.

AUTHOR: DING Bingyun [0002 3521 0061]

ORG: Science and Technology Division, Sichuan Provincial Department of Construction

TITLE: "48-Ton·M Caterpillar Tower Crane"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 7, 81 p 7-

ABSTRACT: In order to utilize construction machines to their full capacity, the Mechanized Construction Company No 1 of Sichuan Province reconstructed the 1004 type 15-ton caterpillar crane into the 48-ton·m caterpiller tower crane, adding 25 tons to the maximum lift capacity of the original machine. Due to the high requirement of ground surface condition of this type of crane, and the limitation of the original transmission, which is retained, the speed of rotation is strictly controlled to a maximum of 1 rotation/minute. The device for observing the incline gradient of that machine is in need of further perfecting. The major technical measures used to reconstruct the crane and the parameters of the finished product are described.

AUTHOR: JIN Acheng [6855 7093 1004]
NIU Baozheng [3662 5508 2973]

ORG: Jilin District Highway Construction Machinery Repair and Manufacturing Plant

TITLE: "TP-3500 Towed Asphalt Concrete Spreader"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 7, 81 pp 8-9

ABSTRACT: On the basis of all basic capabilities of a self-propelled spreader, i.e. spreading, leveling, weighing down, smoothing, arching, and thickness regulating, etc., the complicated mechanisms for self-propelling, the hydraulic operation, heating the presser, etc. are omitted to produce the TP-3500 towed asphalt and concrete spreader. It is designed to be suitable for ordinary medium and small plants to manufacture, repair, and operate, under the current domestic stage of highway construction. It is simply constructed and inexpensive to make. This paper contains a brief introduction of its structure, including a schematic diagram, and its work principle.

6248
CSO: 4009/444

AUTHOR: LIU Zemin [0491 3419 3046]

ORG: Beijing Institute of Posts and Telecommunications

TITLE: "General Parameter Filter"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 1-10

TEXT OF ENGLISH ABSTRACT: This paper extends the theory of the general parameter filter without the complex loss zeros with quadrantal symmetry. That is, the loss and delay time characteristic of pass-bands is a Chebyshev-type approximation and the loss characteristic of stopbands can be specified arbitrarily. Because the nonminimum-phase transfer function can be expressed as the product of the minimum-phase transfer function and all-pass function, the loss characteristic of non-minimum-phase and corresponding minimum-phase transfer functions is the same and a unique relationship exists between the loss and the phase characteristic of minimum-phase transfer function. A series of new formulas for the loss and delay time function have been derived, and the Chebyshev-type approximation of the delay time characteristic of the pass-band and the initial guess of all available parameters have been obtained. In this respect, this paper presents new ideas and methods. The results of this paper can be used to design varieties of filters, including lumped LC filters, active filters, microwave filters, digital filters, etc. The results have been made use of in actual applications and have shown great advantages.

AUTHOR: LIN Yutao [2651 5148 3447]

ORG: Wuhan Digital Engineering Institute

TITLE: "How to Correct Errors of a Position System by Means of a Computer"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 11-18

TEXT OF ENGLISH ABSTRACT: The position system which uses an inductosyn as a transducer can measure the angle and length very accurately. Combining it with the computer constitutes the digital servo system with high precision. This instrument has been broadly used in astronomical navigation, missile controlling, satellite tracking, radar, disk storage, and most kinds of precision machine tools. If the position system works in a static mode, the position error of the transducer will affect the positioning precision. However, once the inductosyn has been made, its position error is fixed, hence we can test its characteristics. In this paper the inductosyn's positional error is analyzed, and from this the mathematical model describing the positional error is formed. The computer can automatically correct the positional error through its error characteristic so that the system's precision of the static positioning will be improved. This is performed by software. "The program for correcting the positional error" written in ALGOL-60 is presented. Because the method is applicable, in principle, to the multipolar rotary transformer, it will be able to make a higher precision position system by use of a lower precision transducer.

[Continuation of DIANZI XUEBAO No 3, 1981 pp 11-18]

When the position system works in the dynamic mode (e.g., to measure the antenna's azimuth), as soon as the system has received the return from an object, the computer must immediately read the antenna's azimuth for computing the coordinate of the object at the moment. Because of the delay in the course of tracking, a dynamic error is introduced to the system, and it affects the dynamic positioning precision of the radar. In this paper, a mathematical model describing the dynamic error is given. Based on this model, a method for testing the dynamic error is developed, which is easy to adopt from the engineering point of view. Also developed here is a new technique to improve the dynamic positioning precision by using a computer to correct the dynamic error. In conclusion, this paper gives the source program for correcting the dynamic error written in ALGOL-60, and the results of running the program on a NOVA machine.

AUTHOR: ZHANG Guoquan [1728 0948 2938]
NI Zhongkuang [0242 6850 0562]

ORG: ZHANG of Shanghai Wire Communication Factory; NI of the Department of Computer Science, Fudan University

TITLE: "Application of Kalman Filtering to Improving Accuracy of Radar"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 19-25

TEXT OF ENGLISH ABSTRACT: Kalman filtering can be used for target tracking, both in electronic scan radar systems and in mechanical scan radar systems. In the former systems it is used to directly initiate beams to move, while in the latter systems it is used for exact measurement without the problems caused by servo tracking structures. The tracking loop formed by Kalman filtering will have target bias-zero tracked when working in parallel with the servo-tracking loop. The state estimation of Kalman filtering serves as the coordinate output of radar measurement as well as the complex control signal for servo systems, thus realizing computer-aided-tracking. The video closing test shows that it performs satisfactorily.

In order to improve the accuracy and to solve the problems caused by the difference between model design and the actual moving of targets, this paper presents an adaptive method of detecting maneuvering by mean-variance and modifying gain directly. The flying tests of an experimental scan array radar show that this method is more effective than those without adaptive constant coefficient tracking systems.

AUTHOR: YANG Zhiyou [2799 5268 0645]

ORG: Xian Research Institute of Navigation

TITLE: "Compiling and Computing a New Type of Navigation Table"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 26-31

TEXT OF ENGLISH ABSTRACT: A new method of compiling and computing the hyperbolic lattice navigation tables is introduced. It is a new double argument navigation table with which the geodesic coordinates can be obtained directly from paired time differences. Its arrangement pattern and contents are completely from those of the present American LORAN table. The position fixing procedures are simplified. The geodesic coordinate of the receiver can be found simply by addition, subtraction and multiplication, and the predicted position of the vehicle need not be known. The troublesome drawing procedure also can be avoided. It takes only 1-2 minutes to make a position fixing by using this new table as compared with 3-5 minutes with the U.S. LORAN table.

AUTHOR: ZENG Lingru [2580 0109 0320]

ORG: Research Laboratory of Applied Physics, Chengdu Institute of Radio Engineering

TITLE: "Theoretical Analysis and Experimental Study of Double Y-Junction Circulator"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 32-36

TEXT OF ENGLISH ABSTRACT: The double Y-junction circulator is constructed by applying shunt open-circuited stubs to the center of a stripline simple junction. Its circuit model is established. The performance of its broad-band low VSWR is theoretically analyzed, and the design for a typical case is presented. A VSWR $\leqslant$ 1.10 and an isolation $\geqslant$ 26 dB are obtained in the 2.7 - 3.7 GHz range. The theoretical analysis coincides with experimental results very well.

AUTHOR: LIU Huizhong [0491 1920 0022]

ORG: Xian Institute of Radio Technology

TITLE: "Strip Polarizer and Strip-grid Polarizer"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 37-44

TEXT OF ENGLISH ABSTRACT: This paper gives two kinds of circular polarizers made of several photo-etched copper strips or strip-grid fiberglass epoxy plates. One is called the strip type, the other being the strip-grid type. The former performs well at center frequency, and the latter has broad-band performance. These two polarizers may be made into a polarized board as a cover set in front of the waveguide horn. Using curves and formulas given in the paper, the design and calculation may be very simple. Experiments have shown that within about 20 percent of the band-width of the strip type polarizer the axial ratio of the circular polarized field is better than 2 dB and VSWR is less than 1.1, and that within more than 20 percent of the band-width of the strip-grid type polarizer the axial ratio of the circular polarized field is better than 1 dB and VSWR is less than 1.1.

AUTHOR: WEN Junding [3306 0193 7844]

ORG: Research Institute No 724, Nanjing

TITLE: "A Generalization of Impedance Transformation Method for the Specific Waveguide"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 45-50

TEXT OF ENGLISH ABSTRACT: In this paper, the generalized impedance transformation method is used to solve the eigenequation and eigenvalue of the fundamental mode in the specific waveguide with various shapes. This method reduces the engineering calculation to solve the general equation. Its conciseness is very obvious, especially in dealing with complex problems. Several typical examples are computed and experimented with. The results of the computation are basically identical with those of Halford, Simmons and Lerner.

The specific waveguides have found many applications in microwave power sources and microwave magnetic devices. There have been a number of methods for analyzing and treating this kind of waveguide, but up to now no concise and general methods have been reported for dealing with various shape waveguides. The introduction of uncontinuous capacitances and the change of matrix elements which change with the variation of transverse impedances are considered, and by using the generalized

[Continuation of DIANZI XUEBAO No 3, 1981 pp 45-50]

impedances transformation method the eigenequation, which is, to a certain extent, general for various shape waveguides, is derived. This method can meet the requirements for engineering calculations.

AUTHOR: WANG Feng [3769 7685]
ZHANG Bingran [1728 3521 3544]
DOU Wenwei [4535 2429 5588]
et al.

ORG: All of the Research Institute of Electronic Materials, Fourth Ministry of Machine Building

TITLE: "Pure GaAs by Vapor Phase Epitaxy"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 51-55

TEXT OF ENGLISH ABSTRACT: In this paper the electro-parameters of high purity GaAs epitaxial layers and their process conditions are reported. The vapor epitaxial growth is obtained in the Ga-$AsCl_3$-H_2 reaction system at high water vapor partial pressure ($\approx 4.1 \times 10^{-5}$ atm) and low deposition temperature ($650^{\circ}C$). The optimum mobility value at $77^{\circ}K$ is 211,000 cm/s.V, and its corresponding peak ($44.2^{\circ}K$) is 329,000 cm/s.V. The $77^{\circ}K$ mobility values are generally repeated at 120,000-200,000 cm/s.V. The high purity materials have an outstanding characteristic of low compensative ratios. In this paper, the experimental results are briefly discussed.

AUTHOR: LONG Dehao [7893 1795 3185]

ORG: Department of Radio Electronics, Sichuan University

TITLE: "An Automatic Gain Control Circuit of Varying Time Constant"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 56-61

TEXT OF ENGLISH ABSTRACT: This paper presents an automatic gain control circuit in which the time constant varies continuously and automatically. Its physical process is first explained, and then its transient state and stable state are analyzed. Finally it is pointed out that the system is a generalization of the general automatic gain control circuit in which the time constant is fixed. Not only can the system suppress high level interference pulses and its output dynamic range, but it can also ensure a sufficiently low countermodulation distortion of useful signals at low levels.

An additional device is chiefly made up of the automatic gain control system of a varying time constant. Connecting the device with the terminal of the short wave receiving equipment EKV-12 (Berlin, 1975), it can lower the error code rate by 67 percent and raise the signal-noise ratio by 10 dB with respect to the EKV-12.

AUTHOR: LU Dakui [0712 1129 1145]

ORG: Shanghai Newlight Telecommunication Factory

TITLE: "A New Type of Frame Sync Code: Super-Barker-Code"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 62-69

TEXT OF ENGLISH ABSTRACT: This paper analyzes the probability of the false-frame sync and the number of false-frame syncs per frame in a digital transmission system. More exact equations for the number of false-frame syncs per frame are derived. It also provides the ideal curves that are different from traditional ones for determining the performance of the frame sync code. Based on this, a new type of frame sync code, the SB code (Super-Barker-Code), is recommended. When used as the frame sync code, its performance is superior to that of the Barker-Code.

AUTHOR: HE Guowei [0149 0948 0251]

ORG: Beijing Institute of Electromechanical Standardization

TITLE: "A Bayesian Approach for Estimating Increasing MTBF"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 3, 1981 pp 70-74

TEXT OF ENGLISH ABSTRACT: The development of a complex electronic system may be divided into several stages. Let λ_1 be the failure rate of the system in the i-th stage. In many situations, the reliability of the system increases stage by stage, i.e., $\lambda_1 > \lambda_2 > \ldots > \lambda_m$. We choose the prior distributions of λ's to be $\pi(\lambda_1) \propto 1/\lambda_1$, such that the Bayes confidence interval of λ following the posterior density function is equivalent to the result of classical statistics. Let $f_1(\tau_1|\lambda_1)$ be the conditional probability function, where τ_1 is the total life time in the i-th stage. The posterior density function then is

$$f_m(\lambda_1, \lambda_2, \cdots, \lambda_m | \tau_1, \tau_2, \cdots, \tau_m) = \frac{\prod_{i=1}^{m} f_i(\tau_i|\lambda_i)\pi_i(\lambda_i)}{\iint_{\Theta}\cdots\int \prod_{i=1}^{m} f_i(\tau_i|\lambda_i)\pi_i(\lambda_i)\,d\lambda_1 d\lambda_2 \cdots d\lambda_m}$$

and the marginal posterior density function of λ_m is

$$f_m(\lambda_m) = \iint_{\Theta'}\cdots\int f_m(\lambda_1, \lambda_2, \cdots, \lambda_m | \tau_1, \tau_2, \cdots, \tau_m)\,d\lambda_1 d\lambda_2 \cdots d\lambda_{m-1}$$

[Continuation of DIANZI XUEBAO No 3, 1981 pp 70-74]

where Θ is the space formed by $\Theta_1 \supset \Theta_2 \supset \Theta_3 \supset \ldots \Theta_m$, Θ_1 is the domain of λ_1, and Θ' is the subspace of Θ. The γ-confidence interval of λ_m is (o, λ_m^*), where

$$\int_0^{\lambda_m^*} f_m(\lambda_m)\,d\lambda_m = \gamma$$

In classical statistics, we can only τ_m to calculate the γ-confidence interval for λ_m, because the statistics $_1$(i = 1, 2, ..., m-1) belong to another population. However, now we can use the formulas derived in this paper to calculate the γ-confidence interval for λ_m, not only by using τ_m, but also by using τ_1, τ_2, ..., τ_{m-1}. The size of the sample of the m-th stage using this method will be smaller than the sample of the m-th stage using the classical statistics method.

9717
CSO: 4009/391

AUTHOR: WANG Benxuan [3769 2609 6513]

ORG: Tianjin Municipal Research Institute of Radio Technology

TITLE: "The DJS132 Digital Computer, a New Computer of the DJS 100 Series"

SOURCE: Beijing DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 7, 81 pp 30-31

ABSTRACT: The DJS132 computer is based on China's highest production volume computer, the DJS130. It is a new type of computer which uses new technology and construction techniques. Its design emphasizes reliability, ease of use and maintenance, as well as amenability to high volume production and a limited number of components. It uses modular construction and fits into a 610 x 307 x 480 mm cabinet and is the smallest of China's comparable computers. It retains the rich and complete software of the DSJ130 and uses the Single Operating System (SOS) and the Real-time Operating System (RTOS), the Real-time Disk Operating System (RDOS,) depending upon the speed and complexity of the peripheral operations. All languages can be used under RDOS, including FORTRAN IV, ALGOL 60, and BASIC.

AUTHOR: NIU Lin [3662 7207]

ORG: Beijing Computer Plant No 3

TITLE: "Improvements to the DJS140 Computer System"

SOURCE: Beijing DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 7, 81 p 32

ABSTRACT: The DJS140 computer system is an improvement over the 100 system. Its design was firmed up in Aug 79. A prototype was produced after one year of efforts. The system hardware includes the central processor, the floating point processor, and the storage protect feature. The cpu has hardware multiply/divide. The internal memory has 64 K words expandable to 128 k. It has a memory cycle time of 1.1 - 1.4 μsec. Peripherals include the real-time clock, plotter, disk, and half inch tape drives. System software includes the MRDOS operating system, and FORTRAN, ALGOL, and BASIC languages. The 140 features increased reliability and improved coordination and serialization.

6168
CSO: 4009/440

AUTHOR: ZHANG Lixin [1728 4539 2450]
LUO Jixun [4382 4949 0534]
YIN Yaode [6892 5069 1795]
et al.

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Effects of Rare Earth on Preferred Orientation in Oxide Scale of a Fe-Cr-Al Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 233-242

TEXT OF ENGLISH ABSTRACT: The effects of RE additions, 0.5 percent Y or 0.15 percent (La + Ce), on the preferred orientation of oxide scale formed at 1200°C in an Fe-Cr-Al alloy have been studied by the inverse-pole-figure method. It was found that the addition of RE elements affects the types of preferred orientation to a limited extent. The main preferred orientation in the oxide scale on three tested alloys are identical as $(01\bar{1}8)_\perp$; whereas some differences are shown among their minor ones with $(11\bar{2}9)_\perp$ and $(10\bar{1}10)_\perp$ for alloys containing Y or La + Ce, and $(0001)_\perp$ and $(10\bar{1}10)_\perp$ for an alloy without RE. RE can play an important part in conserving and enhancing the preferred orientations in the scale, of which Y has a more remarkable effect than does La + Ce.

[Continuation of JINSHU XUEBAO No 3, 1981 pp 233-242]

The oxidation process of the alloys was described by the short circuit dislocation path model. This model makes the variation curve of $P_{10\bar{1}1}$ parameter of the oxide scale in good agreement with the variation curves of oxidation dynamics. This accounts for the fact that RE elements improve the oxidation resistance of the alloy through their effect on modifying the preferred orientation of the oxide scale.

AUTHOR: LUO Yang [5012 7122]
LI Weili [2621 0251 4539]
LI Yufeng [2621 3768 7685]
et al.

ORG: All of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "Effect of Al on the Magnetic Properties of Grain-oriented 3 Percent Si-Fe"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 243-252

TEXT OF ENGLISH ABSTRACT: Studies were made of the effect of Al on the magnetic properties of grain-oriented 3 percent Si-Fe containing about 0.007 wt-percent N and 0.001 - 0.0088 wt-percent Al. The nitrogen content, both soluted and combined in steels, was determined by the hydrogen extracting method. It is shown that every optimum range of Al content in steels is available to its own soaking temperature for the purpose of obtaining proper magnetic properties as $B_{10} \geqslant 1.8$ T and $P15/50 \leqslant 1.05$ W/kg, such as 0.008 - 0.018, 0.005 - 0.022, 0.004 - 0.03 and 0.05 wt-percent Al which correspond to 1200, 1250, 1300 and 1350°C respectively. If any Al content was beyond the optimum range, its magnetic properties would fall steeply to the same extent as that of the value of the non-oriented steel. It is also found that the Al content influences markedly the proportion of AlN which is an effective inhibitor

[Continuation of JINSHU XUEBAO No 3, 1981 pp 243-252]

to normal grain growth. Most effective AlN may be precipitated when the acid soluble Al is within 0.005 - 0.02 percent. Due to the aforementioned results, together with those of electron microscope observation and thermodynamical consideration of AlN and MnS, an approach to the behavior of Al on magnetic properties of grain-oriented 3 percent Si-Fe was proposed, namely, the Al is associated with N to form AlN, and then AlN exists as an effective inhibitor.

AUTHOR: LONG Qiwei [7893 2601 1218]

ORG: Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Relationship between Mechanical Property of Metals and Critical Fracture Angle of a Slanted Crack"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 253-258

TEXT OF ENGLISH ABSTRACT: A new concept of two critical angles was suggested for fracture analysis of a slanted crack. A discussion was particularly made of the material choice for small slant angle experiments. It is shown that all the metallic materials which used to be conventionally employed in such experiments seem to not be the most satisfactory ones.

AUTHOR: YIN Jiang [3009 0561]
XU Jingfeng [6079 4842 1496]

ORG: Both of the Shanghai No 5 Steel Works

TITLE: "Fracture Mechanics Analysis of Cold-drawn Si-Cr Valve Steel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 259-265

TEXT OF ENGLISH ABSTRACT: A fracture mechanics approach was used in studying the cold-drawn splitting in Si-Cr valve steel. It seems that the cold deformation fracture toughness, K_{Ic}, the peak value of cold-drawn tangential residual tensile stress, σ_{tm}, and the depth of surface blemish, a, are the three main factors affecting the splitting. An expression to determine the growth of splits in cold-drawn rods may be as follows:

$$K_{Ic} = \sigma_{tm}(\pi a)^{1/2}(K_I/K_0).$$

The exact value of K_{Ic} is easily given by a cold-heading specimen after cold deformation. Thus, the cold-drawing process makes it possible to control the blemish depth. This process allows the steel to withstand a single cold drawing reduction of 20-30 percent or more at room temperature without splitting or recrystallizing the granular fracture and to give a superior performance that could not be obtained previously by hot drawing.

AUTHOR: ZHANG Jushui [1728 5468 3055]

ORG: Research Institute of Daye Steel Works

TITLE: "Lamellar Fracture Characteristics of Medium-carbon CrNiMoV Steel Forgings"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 266-270

TEXT OF ENGLISH ABSTRACT: The lamellar fracture with streaky matt facets found in the cracked surface of medium-carbon CrNiMoV steel forgings has been observed by TEM. Various extracted second phases in carbon replicas from the fracture surface were identified by selected-area electron diffraction technique and EPMA. The results indicate that the fine globular α-MnS, type-I MnS inclusion and thin platelet or dentritic VC appeared, as well as the flaky complex oxides of Si and Mn, mainly as SiO_2, distributed along the direction of hot forging. The lamellar fracture characteristics relating to intercrystalline cracking are due to various second phase precipitates at the primary austenite grain boundaries. It seems that the lamellar fracture is similar to the "rocky-rock candy" one in cast steel substantially, thus it may decrease remarkably the transverse tensile ductility and lower moderately the impact toughness of the steel.

AUTHOR: ZHANG Zhenfang [1728 2182 5364]
ZHANG Tianyi [1728 1131 1355]
LIU Minzhi [0491 0046 3112]

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Correlation between Numeral Fracture Characteristics and Fracture Toughness of Medium-carbon CrNiMo Steel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 271-277

TEXT OF ENGLISH ABSTRACT: An investigation was conducted to observe the microstructure and macro- or micro-fracture surface, and to determine the fracture toughness and impact toughness of fatigue precracked specimens of four different types of structure of a medium-carbon CrNiMo steel. Some primary results indicated that its highest fracture toughness was evaluated by specimens of sorbitic structure tempered at 600°C, but the lowest were at 300°C. An identical variation is noted between the impact toughness of the fatigue precracked specimens and the fracture toughness from tri-point bending tests. Moreover, the numerical estimation for the various fractured surface characteristics in relation to fracture toughness has been attempted.

AUTHOR: NING Yuantao [1380 6678 3447]
ZHOU Xinming [0719 2450 6900]

ORG: Both of the Institute of Precious Metals Research

TITLE: "A Criterion of the Formation of Amorphous State by Melt Quenching"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 278-284

TEXT OF ENGLISH ABSTRACT: A criterion of the formation of amorphous state alloys by melt quenching has been proposed as $I/\Delta S < 0.032$ and $(I - 0.1)/\Delta S > 0.0044$, where $I = 1 - T_m/T_m$ and $S = \frac{1}{100C_B}(\overline{T}_m - T_m)$, T_m = melting point of the alloy, $\overline{T}_m$ = weighted average melting points of its components and C_B = at percent of solute B. However, this criterion seems to be more accurate since special account has been taken of the effects of alloy composition and intermediate phases. All 127 alloys, with only one exception, checked well with the criterion. Furthermore, the concentration distribution of the amorphous alloys and the characteristics of the allied constitution diagrams have been discussed.

AUTHOR: ZHANG Bangwei [1728 6721 4850]

ORG: Hunan University

TITLE: "Effect of Size Factors on the Formation of Amorphous Alloys"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 285-292

TEXT OF ENGLISH ABSTRACT: An attempt was made to approach the general law of the amorphous alloy formation. From the previous available experimental data, it is proposed that half of the tested inter-atomic distance, instead of the atomic radius of the constituent elements, taken as a measure for predicting the formation of amorphous alloys seems to be more satisfactory. The size factor $\Delta R/R_1$ of the constituents which form the binary or multiple amorphous alloys is usually greater than 9 percent with only a few exceptions. For a binary alloy, the expression which represents the condition necessary for its formation may be given as:

$$\left|\left(\frac{Z}{r_k}\right)_m (\delta x_p)_A (x_{pA} - x_{pB}) \frac{\Delta R}{R_1}\right| \geqslant 0.09$$

About 90 percent of the alloys formed by splat quenching from their melts fulfill the expression.

AUTHOR: JI Jingwen [2061A 2529 2429]
LI Maohua [2621 5399 5478]
XIAO Lianfang [5135 6647 5364]
et al.

ORG: All of the Baotou Institute of Metallurgy

TITLE: "Experimental Studies on Low Temperature Brittleness of Phosphorus Containing Steels and Iron-phosphorus Alloys"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 293-299

TEXT OF ENGLISH ABSTRACT: A fractographic study of 10MnP and 15MnP steels with or without RE additions, as well as on iron-phosphorus alloys under normalized or annealed and then reheated at 700°C WC conditions has been carried out by SEM. The electrode potentials on the fracture or polished surface of the RE free steels have been determined, and further investigations on their fractures have also been made by AES and ion-probe analysis. It was found that no intergranular fracture occurs in any of the specimens ruptured at room temperature to -100°C. Most of the fractures are brittle cleavage in nature, except that a little ductile fracture appeared on fractures of the specimens ruptured at the interval from room temperature to -25°C. It seems that the cleavage fractures are enriched with phosphorus.

AUTHOR: ZHANG Qiyun [1728 0796 6663]
LIU Shuqi [0491 3219 4388]

ORG: Both of the Department of Chemistry, Beijing University

TITLE: "Selection of Filler Metal for Aluminum Brazing and Its Reaction with Base Metal"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 300-306

TEXT OF ENGLISH ABSTRACT: The influence of 28 element additions on the melting point, flowability, corrosion resistance and fillet bending ability of Al-Si type filler metal has been investigated. Among these systems, filler 6M, i.e., Al-Si (13.0)-Be (0.4-0.8)-Sr (0.03-0.06)-La (0.03-0.06), is regarded as the optimum. The erosion mechanism of molten filler metal on base metal has also been studied. In addition to the influences of brazing temperature and the composition of filler metal, the rate of solution of base metal into molten filler and the spreading out of molten filler along the fillet are also of importance in affecting the erosion of base metal during brazing. The fillets were annealed for different time intervals and only a small improvement of their strength and bending capacity was observed.

AUTHOR: ZHANG Yonggang
et al.

ORG: None

TITLE: "Change of Carbon Contamination During Uranium Refining"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 352-354

TEXT OF ENGLISH ABSTRACT: An investigation was undertaken to obtain a better understanding of the increase of carbon contamination in uranium during refining with graphite crucible. The results indicate that the increasing rate of carbon content, c, in uranium melt with respect to refining time, t, may be proposed as:

$$\frac{dc}{dt} = ks(1 - \frac{c}{c_s}),$$

where k is a constant, s is the specific contact surface between melt and graphite crucible, and c_s is the solubility of carbon in uranium melt.

AUTHOR: YANG Yingchang [2799 2019 2490]

ORG: Department of Physics, Beijing University

TITLE: "Structural and Magnetic Properties of $Y(Mn_{1-x}Fe_x)_{12}$"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 3, 1981 pp 355-358

TEXT OF ENGLISH ABSTRACT: The new ternary intermetallic compounds on the iron-rich side, $Y(Mn_{1-x}Fe_x)_{12}$ have been prepared and their magnetic properties investigated. Their structure was found to be of the $ThMn_{12}$ type with x = 0.8 after appropriate annealing. The field dependence of magnetization was measured under the range of 4.2 K to room temperature. The results indicate that $Y(Mn_{1-x}Fe_x)_{12}$ appears antiferromagnetic when x = 0.0, 0.2 or 0.4, in a spontaneous magnetization when x = 0.6, and to become ferromagnetic or ferri magnetic when x = 0.8. The Curie point is above room temperature.

9717
CSO: 4009/363

END

JPRS 78953

11 September 1981

China Report

SCIENCE AND TECHNOLOGY

No. 126

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78953

11 September 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 126

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Reactor Reconstruction, Radiation Monitoring Reported
(YUANZINENG YANJIUSUO NIANBAO, Aug 80) 1

LIFE SCIENCES

Selenium Deficiency Said Cause of Keshan Disease
(WENHUI BAO, 13 Jul 81) 29

ABSTRACTS

CHEMICAL ENGINEERING

HUAGONG XUEBAO /JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING/
No 2, Jun 81 31

ENGINEERING THERMOPHYSICS

GONGCHENG REWULI XUEBAO /JOURNAL OF ENGINEERING THERMOPHYSICS/
No 1, Feb 81 39

MECHANICAL ENGINEERING

JIXIE GONGCHENG XUEBAO /CHINESE JOURNAL OF MECHANICAL ENGINEERING/
No 2, 1981 51

APPLIED SCIENCES

REACTOR RECONSTRUCTION, RADIATION MONITORING REPORTED

Beijing YUANZINENG YANJIUSUO NIANBAO [ANNUAL REPORT OF THE INSTITUTE OF ATOMIC ENERGY RESEARCH] in Chinese Aug 80, annotation and pp 154-163, 207, 216

[Annual report sections on reconstruction of heavy water reactor and radiation monitoring; figures and tables renumbered]

[Text] This yearbook gives a comprehensive introduction to the work by the Institute of Atomic Energy Research in 1979 (1 January through 31 December), including: important progress in nuclear physics, nuclear data and nuclear technology applications, accelerators, nuclear electronics and instrumentation, computers and computer science, radiochemistry, radiochemical engineering, reactor science and engineering, radioisotope production, separation of stable isotopes, treatment of radioactive wastes, environmental production and radiation protection; the maintenance and improvement of important equipment; production procedures; learned activities; and international interchange. In addition, it gives a list of articles published in journals.

This annual report is intended for reference by scientific and technical personnel involved in nuclear scientific and technical research or applications research and by instructors and students in advanced schools.

1. Main Design Aspects of Reconstruction of the Heavy Water Reactor

1.1 Physical Design

In order to increase the thermal neutron flux per unit power output in the experimental channels, to increase the irradiation space in the inner vessel of the reactor and to suitably increase the reactor's reserve reflectivity, a physical design for reconstructing the reactor was developed.

We continue to use low-enrichment uranium and the existing types of fuel elements, so as not to increase the operating costs of the reconstructed reactor.

We compared approaches using a tight lattice and a loose lattice, both with low-enrichment uranium, in addition to considering the possibility of reengineering the reactor. Four-group one-dimensional and two-dimensional programs were used for a rather large number of theoretical calculations and for selected comparisons. The ^{235}U enrichment was varied from 2 to 5 percent, and square lattices with spacings of 18, 13, 12, 10, 9.2, 9.0 and 8.0 cm and an equilateral triangular lattice with a spacing of 10 cm were considered. The effect of central reflecting well dimensions on the peak heat flux value and reflectivity was calculated. The effect of the number and position of control rods and vertical channels was computed. We computed isotope target reflectivities and flux attenuation factors. In addition, a one-dimensional burnup program was used for burnup calculations, and fuel cycle formulas were studied (in addition, a two-dimensional program is now being run).

The same programs and numerical values were used to compute the zero-energy real charge and its distribution so that the computation results could be compared with actual zero-energy data.

The reactor reconstruction approach that was finally chosen was a low-enrichment uranium tight-lattice neutron-well design. The ^{235}U enrichment was 3 percent. The spacing of the square lattice was 9.2 cm; the core height was 101 cm, the equivalent inner radius was 15.57 cm and the equivalent outer radius 46.7 cm. A cross section of the core is shown in Figure 1.

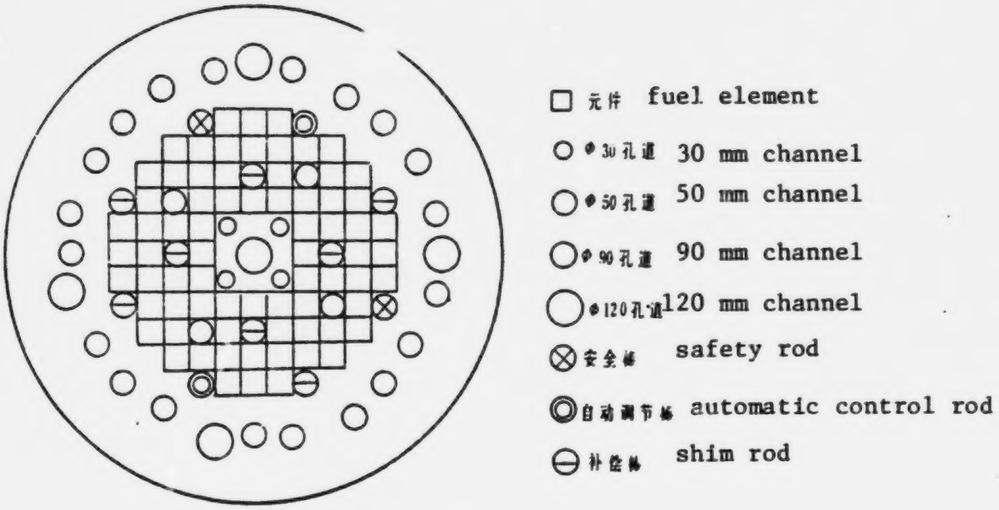


Figure 1. Core layout of the heavy water reactor.

This approach increases the maximum neutron flux per unit power by 50 percent over the value in the unreconstructed reactor, increases the irradiation space inside the reactor by 2.6 times, and increases reserve reflectivity by 3 percent; all of these improvements are favorable for comprehensive utilization.

The zero-energy experimental results indicate that the calculation method and constants used were applicable to the low-enrichment uranium heavy-water reactor lattice and that the computation results are reliable.

(by Cao Yizheng [2580 1355 6927])

1.2 Hydraulic and Thermodynamic Design

The program of hydraulic and thermodynamic improvements primarily involved exploitation of latent capabilities, but also entailed modernization and improvement of some equipment and system piping. The main points are as follows:

A. Primary water system: (1) The original system, in which two pumps were in operation and one was used for backup, was replaced by simultaneous operation of three pumps so as to increase total coolant circulation, but because the circuit resistance was too large, this produced only a limited improvement, and accordingly it was necessary to make changes in the circuit.

(2) Valve No 1 was eliminated, and the 98 mm diameter reactor outlet pipe was replaced by a 128 mm pipe, which was connected to the suction intake of pump C.

(3) The heat exchanger was modernized, the number of parallel tubes was increased from 253 to 447, the heat exchange surface was increased and the flow resistance was lowered.

(4) The hydraulic resistance components in the main reactor intake pipe were removed.

(5) The original flow diaphragm was replaced by a low-resistance diaphragm.

(6) The bypass piping was eliminated.

After these steps were taken, the total coolant flow was 583 m^3/hr when the three heavy-water pumps were operating at 3,000 rpm.

B. Secondary Circuit

(1) The original system of operating two pumps and keeping a third for backup was replaced by operation of three pumps with one in reserve.

(2) The Venturi tube and main flow diaphragm were removed.

After these steps had been taken, the flow capacity of the secondary circuit was 1,800 m^3/hr.

Once the benefits of these changes had been realized, thermodynamic calculations were made for the entire system.

(1) Cooling tower heat diffusion computations: it was concluded that under summer conditions in the Beijing area, when the reactor power was 15 MW the temperature of the secondary circuit water leaving the cooling tower should not exceed 30° C.

(2) Heat exchanger computations: when the reactor power is 15 MW and the secondary circuit flow rate is 1,800 m^3/hr and the water temperature was 32° C, the water in the primary circuit should not exceed 50° C after cooling.

(3) Fuel element cooling computations.

Computation results for several regimes are shown in Table 1.

On the basis of our results we believe that the power of the reconstructed heavy-water reactor will be 15 MW.

(by Huang Daoli [7806 6670 4539])

1.3 Improvement of Process Channel Design

Long-term operation indicated that the structure of the original process channels was too complex, with a rather sealing points, and assembly was difficult, in addition to which there was frequent helium gas leakage during operation. Reconstruction of the reactor required a decrease in the lattice spacing from 130 to 92 mm, but the heads of the original process channels would then be too large and could not be accommodated by the reactor cover. The improved design had the following technical specifications:

Table 1. Results of Thermodynamic and Hydraulic Computations

		After reconstruction		
	Before Reconstruction	clean reactor	control rods fully inserted	isotopes fully loaded
Total coolant circulation, m^3/hr	400	582	582	582
Flow rate per rod, m^3/hr	6.27	10.4	10.4	10.4
Maximum flow speed over element surface, m/sec	3.61	6	6	6
Maximum power per rod, kW	170	305	305	305
Maximum fuel element wall temperature, °C	107	123.8	123.8	123.8
Maximum thermal load, 10^6 cal/m^2-hr	0.842	1.69	1.69	1.69
Radial power inhomogeneity coefficient	1.38	1.33	1.43	1.46
Total reactor power, kW	10350	16550	15400	15100

A. The maximum diameter of the tops of the process channels was decreased from 85 mm to 78 mm so that they could be easily installed and temperature sensor cables could be passed down between them.

B. The heights of the convex aluminum stoppers at the tops of the process channels were decreased from 315 to 128 mm, resulting in a more open reactor top structure in which it was easier to perform decontamination and special operations.

C. The number of sealing points was decreased from four to two.

D. The total number of parts was decreased from 48 to 38, lessening the quantity of raw materials used and the amount of machining needed, and making assembly more convenient.

The following tests were conducted on the process channels after the improvements were made:

A. Flush test of entire process channel.

B. Vibration tests of channels.

C. Tests of hydraulic characteristics.

These tests indicated that the improved process channels met reactor process requirements.

(by Huang Daoli)

1.4 Design Improvements on Automatic Control Rods

It could be inferred from the control rod temperature measurement curves that if there was a helium leak in the control rod guide tubes while the reactor was operating at 15 MW, the temperature of the absorbers (cadmium elements) might reach 800° C. This indicated that continued use of the original control rods after reconstruction would be dangerous.

The design of the control rods was improved, and the helium coolant in their guide tubes was replaced with D_2O, using natural cooling.

Experiments on the operating characteristics of the automatic control rods (original design) in water and nitrogen [helium] indicated that: (1) they could attain a maximum descent speed of 500 mm/sec in either water or helium; (2) there were clear differences between the automatic control rod transition curves in water and in helium; (3) when descending in water, the steel cables attached to the tops of the rods would not curve, so that maneuverability was improved. Clearly, a changeover to operation of the control rods in water met requirements.

An inner tube was added at the center of the new control rods, and the cadmium elements were mounted in the space between the inner and outer tubes, which was filled with helium. This control rod design not only decreased the resistance when they were operated in water, but also made possible two-surface cooling and decreased the rod temperature. The new design is shown in Figure 2. The rods were manufactured by this institute's plant.

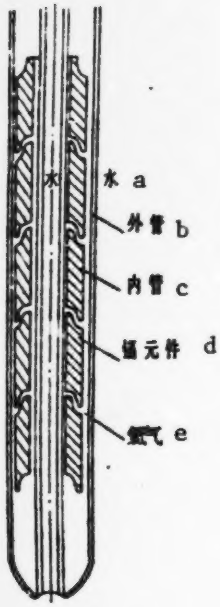


Figure 2. Design of new control rods.

Key:

a. Water
b. Outer tube
c. Inner tube
d. Cadmium element
e. Helium

(by Liu Hanzhen [0491 3352 4394] and
Li Xiuqing [2621 4423 3237])

1.5 Design Changes in the Reactor Inner Vessel

The inner vessel is a major piece of core equipment. LP21 aluminum alloy was used in the design of a reactor inner vessel which met the reconstruction requirements (see Figure 1); sheets and forgings of this alloy were subjected to comprehensive tests which indicated that the chemical composition was in accordance with standard YBT1-63 and the mechanical properties were in accordance with standard YBT4-63, so that design requirements were met. The requirements for the weakest point on the pressure chamber cover were: σ_b = 21-24 kg/mm^2, σ_s = 11-15 kg/mm^2. No intercrystalline corrosion was found, but various degrees of pitting were found on the forgings; ultrasonic defect testing of the forgings did not detect any defects equivalent to Φ_2 or greater.

X-ray tests were made on all welds; 76 percent of them met design requirements, while 24 percent basically met the standards for JB1580-75 class I welds and could be used without repair.

The weld strength was required to be greater than 12 kg/mm^2 and the cylinders were 8 mm thick; strength calculations indicated that these specifications would be adequate.

In order to compensate temperature changes, there was an extensible joint between the upper and lower cylindrical sections of the vessel, of essentially the same shape as in the original vessel. We determined the strength according to the somewhat conservative Kellogg formula and concluded that it was safe. The design also called for fatigue simulation tests. Based on a utilization period of 20 years, and allowing for a fatigue safety factor of 20, a total of 20,000 cycles was required; the test results showed that the joint was whole and undamaged after 23,000 cycles.

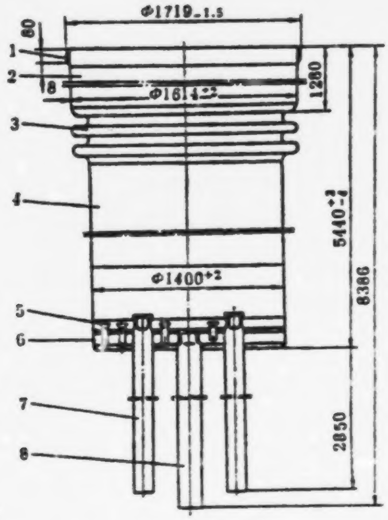


Figure 3. Inner vessel of reactor.

Key:

1. Upper flange
2. Upper cylinder
3. Extensible joint
4. Lower cylinder
5. Cup pieces
6. Pressure chamber
7. Water outlet pipe
8. Water intake pipe

In order to adapt to a heavy-water flow rate of 500 m^3/hr, the height of the pressure chamber water cavity was increased from 50 to 70 mm, and the design provided for 116 cup-shaped pieces on the cover plate, to which the process channels, vertical experimental channels and control rod guide channels would be attached.

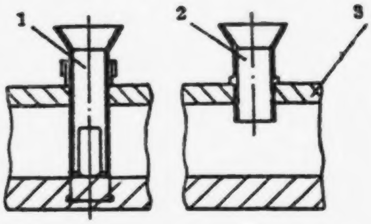


Figure 4. Structure of cup pieces on pressure chamber.

Key:

1. Load-bearing cup piece
2. Cup piece
3. Pressure chamber cover plate

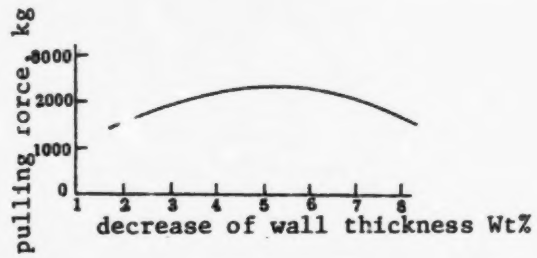


Figure 5. Relationship between pulling force and change of thickness for LT21CZ alloy.

Following strength tests of the cover plate, the number of load-bearing cup pieces (see Figure 4) connecting the cover plate to the pressure chamber was increased from 64 to 84. All cup pieces were fixed to the cover plate with expansion joints. Multiple tests gave the expansion value (expressed as the rate of decrease in wall thickness Wt%) which produced optimum expansion joint strength and sufficient gas tightness. The expansion joint strength was greatest when Wt% was 5 percent (see Figure 5).

(by Gao Jintang [7559 6930 1016] and
Li Yanshui [2621 1750 3055])

1.6 Design Improvements on the Main Heat Exchangers

We have designed and fabricated two horizontal tube-and-shell heat exchangers.

The two ends of the outer shell were assembled with hexagonal welds and welded to the tube plate with circular outer welds. The inner shells are fully expansion-joined and argon arc welded to the tube plate. With the exception of two fresh water cavities made of carbon steel, the rest of the unit is made of 1Cr18Ni9Ti stainless steel.

The heat exchanger cooling surface has been increased from 58 m^2 to 102 m^2, and the outer dimensions have been increased by only 15 percent, making it possible to meet fully the requirement that it be installed in the original process room.

The first of the main heat exchangers was flush tested off-loop and achieved the required characteristics in a vacuum leak test: the total leakage was 3.14×10^{-6} torr-l/sec. The second unit is now being tested.

(by Yuan Shuiquan [5913 3055 2164] and
Li Yanshui)

1.7 Design of the Main: Reactor Shielding

We used a one-dimensional 31-group shift diffusion formula for neutron calculations and a point-source attenuation model to compute an infinite uniform medium Taylor buildup coefficient, which was used to calculate the gamma ray figure by the multilayer flat plate integral method. The calculation results showed that the main shielding would be adequate following reconstruction. If the radial water tank should lose water, the total dose rate would increase by 5.5 times and the neutron dose rate by 560 times; but because the neutron dose rate is only 3 percent of the total dose, the problem is still primarily that of gamma ray protection. The calculated neutron dose at the surface of the reactor after loss of water by the water tank would be within the permitted range. The shield water tank acts primarily as a thermal screen, but loss of water would increase the heating rate of the heavy concrete biological shield by a factor of 10, and the heat conducting effect of the water in the inner layer would be lost, so that an excessive temperature buildup in the heavy concrete would be the main unfavorable consequence of loss of water by the water tank. The ray method was used to estimate the neutron and gamma ray dose in the horizontal experimental channel: the calculated values were in general agreement with measurements.

(by Zhu Huannan [2612 3562 0589])

1.8 Improvement of the Air Purification System

The original exhaust system had no exhaust air purification equipment; three new exhaust units with three exhaust filter chambers have now been installed. Each of the chambers has two filter units in series. The first unit has six high-efficiency glass fiber filters which eliminate at least 99.91 percent of particles measuring 0.3 microns or larger. The second unit has eight activated charcoal filters which eliminate iodine vapor released during a reactor emergency.

The activated charcoal bed is a newly-designed model F filter unit whose main characteristics are given in the table below.

Xinhua No 8 charcoal is being used temporarily. The metal structural components of the filter are ordinary carbon steel. The charcoal is packed manually, then subjected to spot testing by the impact method. The charcoal filter nets are made of two different materials: one is GG 40-42 mesh silk gauze and the other is #078 24-mesh stainless steel screen.

The high-efficiency filter and activated charcoal filter are installed in steel brackets in the filter channel of the air chamber and can be installed or replaced individually.

During reconstruction of the reactor, the blower system was also improved, the Soviet-made Lieke [phonetic] metal net wet-stator oil type electrically-powered filter unit was replaced by an Ml foam plastic filter, a water-type heater was replaced by a steam heater, and the relevant heat supply piping was modernized; the blower was reconditioned in 1979, producing a great improvement in air purity in the facility.

Table 2. Main Parameters of the Model F Filter

Characteristic	Value
Filter surface, m^2	0.468
Air flow, m^3/hr	500
Surface speed, m/min	14.4
Specific flow rate, liters/cm^2-min	0.9
Thickness of activated charcoal layer, mm	58
Charcoal layer resistance, mm H_2O	18.27
Structure resistance, H_2O	16
Weight of iodine remover, kg	55
Installed weight of activated charcoal, kg	20

(by Yuan Shuiquan)

1.9 Initial Estimates for the Production of Trans-Plutonium Elements for Research Use

Reconstruction of the heavy water more than doubled the neutron flux and energy spectrum parameters. We have made estimates of the capability for producing trans-plutonium elements for research, assuming various irradiation targets and irradiation regimes. On the basis of accumulation laws for different nuclides in chain reactions, exchanging various irradiation targets between the central channel and the reactor channels at suitable times so as to make alternating use of high thermal neutron flux and high resonance neutron flux makes it possible to increase the yield of ^{252}Cf, the ultimate product, by 25 to 70 percent. The main calculation results are:

A. Irradiation of 1 g of ^{241}Am for 400 days will yield 0.01 g each of ^{243}Am and ^{244}Cm;

B. Irradiation of 1 g each of ^{243}Am and ^{244}Cm for 600 days will yield 0.1 mcg of ^{252}Cf;

C. For irradiation of ^{241}Am to produce ^{242}Am, it is best to use a channel with high resonance neutron flux; if 1 g of ^{241}Am is irradiated in a core channel, a maximum quantity of 0.757×10^{-2}g of ^{242}Am will be obtained after 40 days;

D. In irradiating ^{241}Am to produce ^{242}Cm and ^{244}Cm, it is best to use the channels with high thermal neutron flux. If 1 g of ^{241}Am is irradiated in the central channel, a maximum of 0.4 g of ^{242}CM will be obtained after 140 days; irradiation for 400 days will produce 0.01 g of ^{244}Cm, 0.1 mg of ^{245}Cm, 0.07 mg of ^{246}CM, 0.3 mcg of ^{247}Cm and 0.2 mcg of ^{248}Cm;

E. Irradiation of 1 g of ^{242}Pu for 100 days will produce: 0.17 g of ^{243}Am, 0.06 g of ^{244}Cm, 0.55 mg of ^{245}Cm, 0.37 mg of ^{246}Cm, and 0.3×10^{-10}g of ^{252}Cf.

2. Replacement of the Inner Vessel of the Heavy Water Reactor

2.1 Summary

The following factors were taken into account in the decision to lift out the entire inner vessel of the reactor: (1) whether 20 years' neutron irradiation of the blocks in the graphite reflective foundation in which the inner vessel was installed had caused sufficient change in their dimensions to wedge the inner vessel in place; (2) whether the inner vessel still had sufficient mechanical strength and a sufficient percentage elongation value after 20 years' operation; (3) whether the traveling crane in the reactor room had sufficient hoisting height; (4) whether remote control would be sufficiently reliable in the hoisting out the highly radioactive vessel; (5) whether it would be possible to bury the vessel in a burial shaft in the northern part of the reactor room and store it there for a long period.

Disassembly of the reactor included: (1) lifting all uranium rods, control rods, temperature measuring instruments, water level instruments and experimental channels out of the inner vessel and using a deep-well eccentric pipe cutting tool to cut off all channels which were pinched shut; (2) removing the fan-shaped water tank from the top of the reactor and removing the annular water tank; (3) removing the large sealing flanges between the aluminum protective cap and the inner vessel and between the inner and outer vessels; (4) hoisting out the aluminum protective cover by remote control and automatically inclosing it in a protective cover; (5) after a preliminary raising of the vessel, hoisting it out by remote control and inclosing it in a protective cover, using a television system to monitor its transport to the burial pit; (6) replacing the aluminum cover on the vessel and sealing both in the same pit for long-term storage.

Spot checks were made of four experimental channels in the graphite reflector, and an underwater television system was used to make a macroscopic examination of the inner vessel. No abnormal deformation was found, proving that the theoretical analysis of dimensional changes produced in the graphite reflector was reliable.

In order to hoist out the inner vessel safely and reliably under remote control, we carried out a complete simulated trial run. The inner vessel used in the trial run had the same dimensions and shape as the actual vessel. The trial run was used to train personnel and to make a final determination fo the positional coordinates of the vessel.

The necessary strength calculations were made for all hoisting equipment and cables, and load tests were performed; a safety factor of 10 was used.

Before the inner vessel was hoisted, an inspection and adjustment of the critical hoisting equipment, namely the overheal traveling crane, was made in order to assure normal operation.

A correct evaluation of radiation dose levels in the work area and in the disassembly equipment during disassembly of the reactor was of great importance for deciding on the hoisting procedure shielding measures for work at the site, and work schedules; special consideration was devoted to radioactive dust from the vessel and the aluminum protective cover. A protective cover in which the vessel and its cover could be automatically enclosed so as to prevent the diffusion of radioactive dust was specially designed and manufactured. After comprehensive preparations had been made, the reactor vessel, which had been in operation for 20 years, was successfully hoisted out on 5 June 1979 and buried in the burial shaft.

A dynamic analysis was made of the condition of the new reactor vessel in the horizontal and vertical position. This analysis showed that during suspension it was not necessary to use elaborate reinforcement measures, which simplified the installation process.

In order to assure safety, correctness and reliability in the installation of the new vessel in the highly radioactive area, a specially designed and manufactured contact sensor was installed at the ends of two of the inner vessel's water outlet pipes; these, together with other positioning measures, assured that the new vessel would be correctly lowered into the graphite reflector foundations, and on 28 December 1979 the new vessel was safely placed in the reactor.

Currently various types of installation and adjustment work are under way following the placement of the vessel. It is expected that all of the work involved in replacing the inner vessel will be completed within the first half of 1980.

(by Li Yulun [2621 3768 0178])

2.2 Analysis of the Irradiation Characteristics of the Graphite Reflector

The main factors affecting the irradiation dimension changes of the graphite blocks are: the irradiation temperature, the integral fast neutron flux ($E > 0.18$ MeV), the composition of the blocks, the production process used, and the orientation of the blocks in the reactor (pressed graphite has pronounced anisotropy). Measurements of the electrical resistivity of the blocks in different directions was used to determine their orientation in the reflector. A statistical analysis was made of the 20 years' operating history of the reactor. The actual graphite layer temperature values were used to determine the radial temperature distribution in the graphite reflector, and as an approximation, the actual radial neutron flux distribution was used in place of the temperature distribution, except that the measured temperature value was used for the highest point. The total amount of energy released during 20 years of operation of the reactor, the results of a two-dimensional four-group reactor physical computations and one-dimensional three-group shield calculations, and the measured nickel flux and thermal flux were used to determine the integral fast neutron flux corresponding to the calculated irradiation dimension changes. The computed results indicated that the dimensional change of the graphite reflector resulting from irradiation was not large and would not cause the inner vessel to become wedged in it. Observations made in the channels in the graphite reflector revealed no abnormal deformation. Observations of the inner surface of the inner vessel also failed to show pressure-induced deformations resulting from swelling of the graphite during irradiation. Finally, after the inner vessel had been hoisted out of the reactor, a visual determination of the condition of the graphite layer was made; this confirmed the conclusions based on analysis and calculations. The photograph shows the condition of the graphite reflector foundation after the inner vessel was moved.

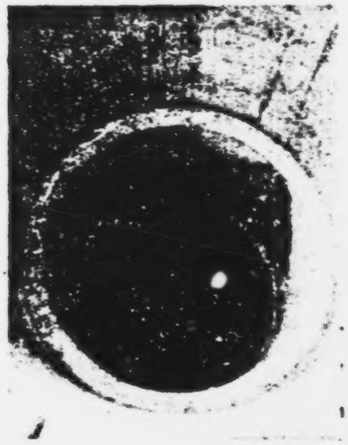


Figure 6. Condition of the graphite reflector layer after removal of the inner vessel.

In addition, after analysis of the latent energy in the graphite layer it was concluded that it did not prevent a serious problem, and that provided no high-temperature operations were carried out in its vicinity there would be no release of latent energy. An analysis of the strength and oxygen resistance of the blocks concluded that both characteristics were excellent.

2.3 Design Considerations for the Inner Vessel Burial Pit

A new inner vessel burial pit was dug in the northern part of the reactor room. It was designed as a vertical shaft 9.5 meters deep with an upper diameter of 1.8 m and a lower diameter of 0.8 m. The upper dimension was chosen so as to provide room for the vessel to be inserted into the shaft while suspended. The shaft was surrounded by a concrete screen and had a stainless steel inner liner to prevent entry of subsurface water. The top was provided with a steel cover, a rubber gasket and a cement cover slab, which were level with the reactor room floor so as not to decrease the operating area in the room. External radiation was at the background level. The pit was provided with ventilation and with seepage detectors, and after the vessel was inserted the top was sealed and the air pipe cut off to prevent gas diffusion. In addition to the old vessel, the highly radioactive aluminum cap 3.2 m high and 1.7 m across was buried in the pit.

During design of the earth works, full account was taken of the plan location of the pit, the strength of the foundation soil, and engineering safety. A location where the existing foundations would not be affected was chosen, and the open caisson method used. Such geological characteristics as the subsurface water table were determined to assure that the work would proceed smoothly.

(by Tao Qingcheng [7118 3237 3397] and
Gu Chuanbing [6253 1557 0365])

2.4 Examination of the Inner Vessel

An underwater television system was used to inspect the old vessel. After the heavy water was exhausted from the vessel it was filled with light water as a shield. A special underwater television frame was designed. The television camera unit could be moved in three dimensions in the water-filled vessel. Particular attention was devoted to observing the welds in the vessel, the heavy water-helium boundary line, and corrosion in the pressure chamber cup pieces and other components. It was concluded that the corrosion was not serious; the inner surface of the vessel in the core section showed no abnormal deformation; the vessel strength calculations and analysis were reliable; and it was judged to be feasible to hoist the entire unit out.

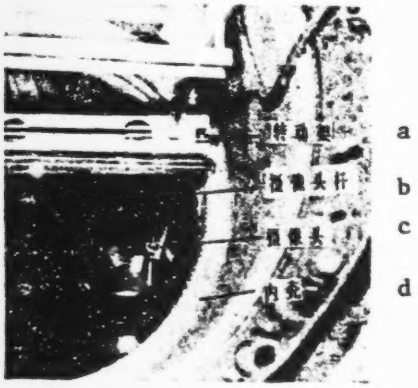


Figure 7. Inspection of the old vessel.

Key:

a. Rotating cramework
b. Camera rod
c. Camera
d. Inner vessel

(by Chen Rongfan [7115 2837 3058])

2.5 Equipment for Raising the Vessel

Before the vessel was hoisted out, in order to make a final determination as to whether it was jammed or wedged, equipment for raising it was designed and produced. It consisted of an I-beam, an electric weighing scale, a hoisting jack, cables and tackle, and a protective water tank. The entire weight was supported by the annular water tank around the reactor. The horizontality of the hoisting equipment could be controlled to within 0.2 mm, and the vessel could be raised 150 mm. The electrical scale continually displayed the weight of the inner vessel and fixtures so as to make it possible to determine at any time whether the vessel was jammed or wedged or whether any other trouble had occurred.

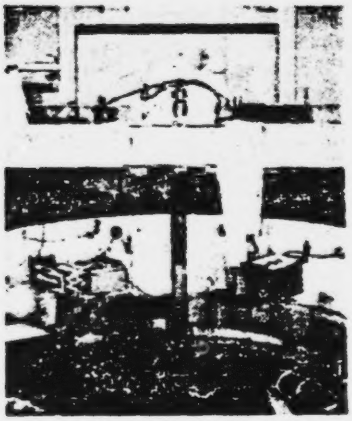


Figure 8. The equipment for raising the vessel.

(by Kang Yalun [1660 0068 0243] and
Gu Cnuanbing)

2.6 The Protective Covers for the Vessel and Aluminum Cap

In order to prevent the scattering of radioactive dust during the hoisting of the old vessel and cap, a protective cover was designed and manufactured. This consisted of a guard ring, a fastening bolt, an elastic rubber ring, and white silk fabric, which were installed on the reactor cover slab. When the traveling crane hoisted the vessel or cap up, it was automatically inclosed in the cover, and when they were entirely lifted out of the reactor, the rubber ring tightened automatically, inclosing the vessel and cap in the protective cover. This equipment was easy to operate and prevented the scattering of radioactive dust; the results were excellent, there was no environmental pollution, and design requirements were met.

Figure 9. The protective cover for the vessel and aluminum cap (the transparent section is made of transparent plastic sheet to allow observation of the vessel surface).

(by Zeng Jiannong [2582 1696 6593]
and Tan Yixian [6151 1355 0341])

2.7 Turning the New Inner Vessel

The new inner vessel is a cylindrical container made of LT21 aluminum alloy 5.4 m long, with upper and lower diameters of 1.6 and 1.4 m respectively. The bottom of the cylindrical body has five water intake and outlet pipes 2.85 to 2.95 meters in length. It is brought into position by horizontal movement, but before it is installed it must be turned to a vertical position for insertion.

When the reactor was built, the inner vessel was rotated by the combined use of the main hook of the traveling crane and a temporarily installed hoist. When turning the vessel, the cylindrical sections and extensible joint were protected by clamps, struts and reinforcing bars.

We conducted a dynamic analysis and rigidity and strength calculations and used a new method following a dry run. The main and auxiliary hooks of the reactor room traveling crane were used to suspend the central suspension ring on the upper end and the cable on the lower end respectively, and the vessel was turned smoothly after being hoisted horizontally to a height of 3.5 m.

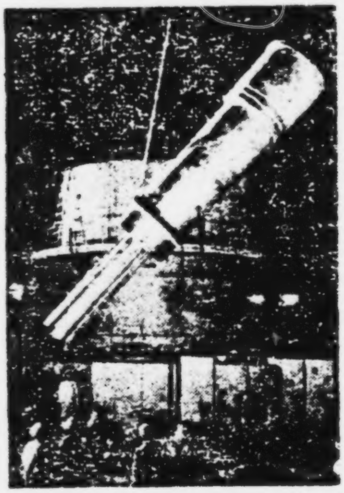


Figure 10. Turning the new inner vessel.

(by Song Lixin [1345 4539 2450] and
Shen Hongyang [3088 1347 2254])

2.8 The Contact Sensor

The five inlet and outlet tubes at the bottom of the inner vessel are rather long, are made of soft, not very rigid material, and are installed with small clearances.

When the vessel is installed in its place by remote control, the interior cannot be observed directly, and accordingly we installed two contact sensors on two symmetrically located water outlet pipe ends.

The contact sensor (see figure) is of the expansion plug type, in which a nut squeezes a rubber pad and causes it to expand inside the piping. The rod has an insulator around it, and a copper piece at the tip. If the contact head encounters an obstacle, the electrical circuit emits an obstruction signal which stops operation, and the workmen can adjust the position of the vessel. In practice the device has proven to be simple in design, has given sensitive and reliable readings and has been easy to install and remove, and thus has served to protect the equipment.

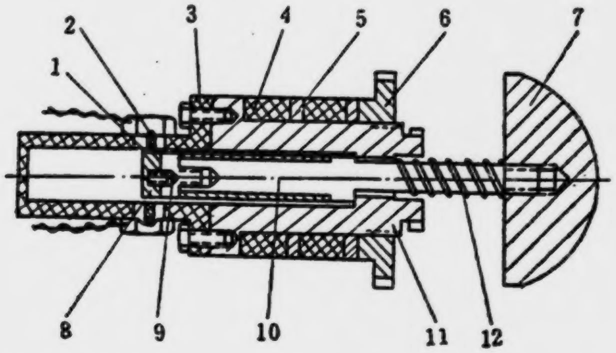


Figure 11. The contact sensor.

Key:

1. Copper contact
2. Spring
3. Bakelite cover
4. Rubber pad
5. Spacer
6. Nut
7. Semicircular head
8. Copper piece
9. Bakelite
10. Contact rod
11. Core
12. Spring

(by Zeng Jiannong)

Radiation Protection

1. Radiation Monitoring and Evaluation

A. Individual Dose Monitoring

In 1979 our institute used the following methods to monitor individual external radiation doses: beta-gamma film dosimeters, fluorescent glass dosimeters, and ring-type LiF thermoluminescent dosimeters, i.e. polyethylene film containing lithium fluoride. External doses of beta particles, gamma rays and neutrons were monitored. The beta-gamma film dosimeters had a detection period of a month, the fluorescent glass dosimeters 3 months, and the ring-type dosimeters a week. A measurement can be made any time an extraordinary circumstance arises. Individual internal dose monitoring included: (1) analyzing the quantities of various radioactive nuclides in urine samples from the workers; and (2) using whole-body counters to determine the accumulated dose of gamma-emitting nuclides.

(1) Individual External Dose

In 1979, individual external dose monitoring was carried out for 713 persons. The collective dose received was equivalent to 581.90 man-rem (5.819 man=Sv), an average equivalent annual dose of 0.80 rem (8.0 mSv). The data on whole-body external radiation doses received by workers in 1979 are given in Table 3. The 15 persons who had dose levels exceeding the maximum permissible annual figure were all isotope production workers.

Table 3. Whole-Body External Radiation Doses Received by Personnel in 1979

dose equivalent range rem (mSv)	number of persons monitored	% of total
≤0.5(5)	432	60.6
>0.5—≤1.5(>5—≤15)	191	26.8
>1.5—≤2.5(>15—≤25)	50	7.0
>2.5—≤5(>25—≤50)	25	3.5
>5.0(>50)	15	2.1

The annual whole-body accumulated dose received by one of these persons was 24.0 rem (240 mSv), which was 4.8 times the maximum permissible annual equivalent dose. The main reasons were: (a) neglect of necessary on-site protection and monitoring when cleaning hot cells; (b) poor protection during some processes. The distribution of external radiation doses received by workers in different types of jobs are shown in Table 4.

Table 4. Distribution of Radiation Doses Received by Workers in Different Jobs

工作性质 a	人数 b	≤0.5rem (≤5mSv)	>0.5—≤1.5rem (>5—≤15mSv)	>1.5—≤2.5rem (>15—≤25mSv)	>2.5—≤5 rem (>25—≤50mSv)	>5rem (<50mSv)
c 反应堆	331	216	99	16		
d 同位素生产	162	50	38	34	25	15
e 放射化学	23	13	10			
f 核物理实验	49	39	10			
g 保健物理	22	21	1			
h 三废处理	38	38				
i 其他	88	55	33			

[Key on following page]

Key:

a.	Nature of work	f.	Nuclear physics experiments
b.	Number of persons	g.	Health physics
c.	Reactor	h.	Waste treatment
d.	Isotope production	i.	Other
e.	Radiochemistry		

(2) Individual Internal Radiation Doses

The main radioactive nuclides for which the urine of workers was analyzed in 1979 were ^{3}H, ^{106}Ru, radioactive strontium and total beta. In addition, the ^{239}Pu content of some workers' urine was monitored on an ongoing basis. The results are shown in Table 5.

Table 5. Results of Urine Analysis of Workers in 1979

a 被监测核素	被监测 b 人次	尿中各种放射性 c 核素的参考水平	小于$\frac{1}{2}$参考水平的 d 人次	等于或大于$\frac{1}{2}$参考水平， e 小于参考水平的人次	大于参考水平的 f 人次
^{3}H	248	2μCi/l (7.4×10^{4}Bq/l)	205	21	22
^{106}Ru	12	0.3nCi/24h·Urine (11.1Bq/24h·Urine)	12		
g 放射性锶	21	50pCi/24h·Urine (1.85Bq/24h·Urine)	21		
h 总 β	52	50pCi/24h·Urine (1.85Bq/24h·Urine	38	13	1
i 总 计	333		276	34	23

Key:

a.	Nuclide monitored	e.	Number of persons with more than 1/2 but less than 1x reference level
b.	Number of persons tested	f.	Number of persons with more than reference level
c.	Reference level of nuclide in urine	g.	Radioactive strontium
d.	Number of persons with less than 1/2 of reference level	h.	Total beta
		i.	Total

At the end of 1978 a whole-body counter developed by our institute went into use in routine monitoring. It was used primarily for monitoring of personnel taking part in the overhaul of the reactor and ordinary operations personnel, but in addition monitoring was conducted on isotope production personnel and health physics personnel. None of the results exceeded 1 percent of the maximum permissible internal accumulation. (see Table 6)

Table 6. Results of Determination of Accumulated ^{137}Cs and ^{60}Co in Bodies of Reactor Workers

type of reactor	no. persons monitored	^{137}Cs, nCi(37Bq)			^{60}Co, nCi (37 Bq)					
		$\leqslant 2$	$\leqslant 5$	$\leqslant 10$	$\leqslant 2$	$\leqslant 5$	≤ 10	≤ 20	≤ 50	≤ 100
heavy water	100 a (堆大修改建 前 堆 前)	9	28	63	41	43	13	3		
	, 78 b (堆大修改建中)	17	31	30	19	36	12	5	3	3
swimming pool	90	45	28	17	66	24				
total	268	71	87	110	126	103	25	8	3	3

Key:

a. Before reactor overhaul and reconstruction
b. During reactor overhaul and reconstruction

(by Dong Liucan [5576 2692 3605])

2. Environmental Radioactivity Monitoring

In 1979 our institute conducted environmental monitoring of gasborne effluents, liquid effluents and environmental media (air, water, plants). The radioactive nuclides which were analyzed and surveyed were: total alpha, total beta, ^{125}I, ^{131}I, ^{3}H, ^{90}Sr, ^{106}Ru and ^{137}Cs, in addition to gamma irradiation rates. The maximum radius of monitoring activity was 20 km. The locations of the air, water and plant monitoring stations are shown in Figure 12.

[Figure 12 and Key on following page]

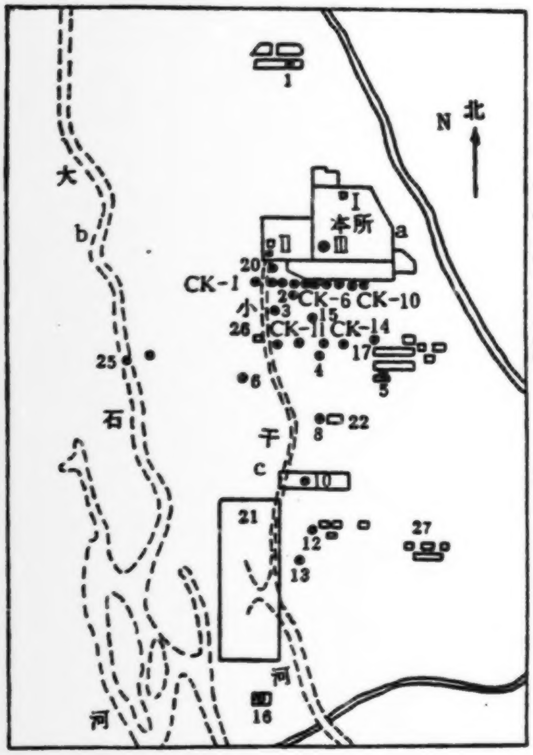


Figure 12. Locations of Environmental Monitoring Stations

Key:

I. Monitoring station #1
II. Solid and liquid waste storage facility
III. Heavy water reactor cooling tower
1. Shawo Village
2. Outside south wall
3. Northeast of weather station
4. West of Beifang Village
5. Beifang Village
6. Southwest of weather station
8. Southwest of sewage area
10. Firefighting equipment plant
12. West of Jiaozhuang
13. North of wooded area
15. Pond in Beifang Village
16. Normal school
17. Beifang Village vegetable plot
20. Main industrial wastewater discharge point
21. Bridge plant
22. Domestic sewage area
25. Dashi River wastewater discharge point
26. Weather station
27. Jiaozhuang Village
a. Institute
b. Dashi River
c. Xiaogan River
d. Location and number of monitoring point
e. Road
f. Watercourse

A. Air Monitoring

Our institute's gasborne radioactive effluents are discharged into the air primarily by eight 30-60 m smokestacks and several low smokestacks. The concentrations and total quantities of radioactive nuclides discharged into the atmosphere are shown in Table 7. One of the nuclides which are discharged in the largest quantities is ^{131}I. Measures are currently being taken to decrease discharges of ^{131}I and ^{125}I.

[Table 7 and Key on following page]

	total α	total β	^{131}I
concentration range, Ci/l [Bq/m³]	1.1×10^{-15}—2.8×10^{-14} [4.1×10^{-2}—1.0]	1.7×10^{-16}—1.2×10^{-12} [6.3×10^{-3}—44]	2.3×10^{-12}—4.3×10^{-10} [85—1.6×10^{4}]
annual dose Ci [Bq]	1.4×10^{-3} [5.2×10^{7}]	2.3×10^{-2} [8.5×10^{8}]	9.8 [3.6×10^{11}]

	^{125}I	^{3}H	^{41}Ar etc.
concentration range Ci/l [Bq/m³]	$(1.1-4.0)\times10^{-12}$ [41--1.5×10^{2}]		$(1.0-8.4)\times10^{-8}$ [3.7×10^{5}—3.1×10^{6}]
annual dose Ci [Bq]	0.34 [1.3×10^{10}]	113 [4.2×10^{12}]	1.4×10^{3} [5.2×10^{13}]

Table 7. Radioactive Nuclides Discharged into the Atmosphere Through Smokestacks

Key:

a. Concentration range
b. Total amount discharged annually

B. Water Monitoring

Most of our institute's radioactive wastewater is discharged into the environment through one of two routes. The first is that weakly radioactive wastewater is discharged into the Dashi River during the rainy season after treatment. The other is that that radioactive waste with concentrations lower than the disposal limit are discharged directly into the Xiaogan River south of the institute. The main radioactive nuclide is ^3H (see Table 8).

Table 8. Quantity of Radioactivity Discharged into the Environment in Water

discharge location	Dashi River		Xiaogan River
discharge, tons	1.1×10^{3}		5×10^{3}
nuclide	total β	^{3}H	total β
conc. range Ci/l [Bq/m³]	$(0.24-1.9)\times10^{-11}$ [$(89-7.0)\times10^{2}$]	$(0.3-5.5)\times10^{-6}$ [$(0.11-2.0)\times10^{8}$]	4.3×10^{-12}—1.5×10^{-10} [$(0.16-5.6)\times10^{3}$]
total, Ci [Bq]	4.3×10^{-6} [1.6×10^{5}]	4.5 [1.7×10^{11}]	2.8×10^{-2} [1.0×10^{9}]

When discharges were made into the Dashi River, the quantity of ^3H in the river water was monitored at a point not far from the discharge point. It was found that the concentration limits given by the state standards for surface water resources were not exceeded (see Table 9).

Table 9. Concentration of ^{3}H in Dashi River During Discharge of Radioactive Wastewater (x 10^{-9} Ci/liter (Bq/m^3))

distance to discharge site, m	60	100	400	1500
concentration range	2—4.4 [(7.4—16)×10^4]	2—6.6 [(7.4—24)×10^4]	2—4.7 [(7.4—17)×10^4]	2—2.9 [(7.4—11)×10^4]
avg. concentration	2.5 [9.3×10^4]	3.2 [1.2×10^5]	3.1 [1.1×10^5]	2.2 [8.1×10^4]

The results of monitoring of subsurface water during our institute for radioactive nuclides are given in Tables 10-12. The monitoring results show that the scope of subsurface water pollution downstream from our institute currently is still essentially constant south of the institute, north of the firefighting equipment plant, east of the weather station and west of Beifang Village. Other than that found in well CK-6, the concentrations are not in excess of state stqadards for concentrations in exposed water sources. Total beta radiation in the six monitoring wells 101-1 through 101-6 was lower than in 1978.

Table 10. Concentration of ^{90}Sr in Subsurface Water

location	conc. range ×10^{-12}Ci/l [Bq/m^3]
Shawo Village	0.7 [26]
outside south wall	22.0 [8.1×10^2]
W of Beifang Village	5.4 [2×10^2]
SW of sewage area	2.1 [78]
Beifang Vil. vegetable plot	2.1 [7.8]
CK-5	7.2 [2.7×10^2]
CK-6	131.5 [4.9×10^3]
CK-10	3.5 [1.3×10^2]

Table 11. Concentration of ^{137}Cs in Subsurface Water

Location	concentration [$\times 10^{-3}$ Bq/m^3]
Shawo Village	75 [2.8×10^3]
outside south wall	151 [5.6×10^3]

Table 12. Concentration of ^3H in Subsurface Water

Location	conc. $\times10^{-9}$Ci/l [Bq/m^3]	Location	conc. $\times10^{-9}$Ci/l [Bq/m^3]
Shawo Village	2.8 [1.0×10^5]	wastewater tank 101-1 monitoring well	5.3 [2.0×10^5]
outside south wall	3.2 [1.2×10^5]	101-2 "	45 [1.7×10^6]
Beifang Village	4.6 [1.7×10^5]	101-3 "	1.2×10^2 [4.5×10^6]
Beifang Village vegetable plot	5.4 [2.0×10^5]	101- "	8.2 [3.0×10^5]
CK-5 well	2.3 [0.9×10^5]	101-5 "	4.9 [1.8×10^5]
CK-6 well	3.2 [1.2×10^5]	101-6 "	4.2 [1.6×10^5]
CK-7 well	3.7 [1.4×10^5]	E of water tower	17 [6.3×10^5]
CK-10 well	4.4 [1.6×10^5]	total discharge	5.2 [1.9×10^5]

C. Vegetation Monitoring

There are three sampling points for vegetation monitoring: Shawo Village, Beifang Village and Lugou Bridge (control). Samples include vegetables, grain and oil plants. Surveys are made of total beta, beta other than potassium, ^{90}Sr, ^{137}Cs, ^{131}I, ^{125}I, K and Ca. Comparisons with the control point and with historical data do not show any significant pollution of vegetation in the vicinity of our institute with ^{90}Sr or ^{137}Cs. But the concentrations of ^{131}I and ^{125}I are relatively high in some plant samples. The maximum values on plant leaves are 1.6 x 10^{-8} Ci/kg (5.9 x 10^2 Bq/kg) and 1.3 x 10^{-8} Ci/kg (4.8 x 10^2 Bq/kg) respectively.

D. Gamma Radiation Monitoring

In order to evaluate the external radiation dose to which our institute subjects the public, we used a gamma radiation meter and a $CaSO_4$:Dy thermoluminescence dosimeter to monitor gamma dosage rates in the vicinity of the institute. The average annual gamma radiation level inside the institute was 120 mR, the minimum value was 62 mR and the maximum value was 401 mR. The annual gamma radiation rate at 31 stations located within 15 km of the institute was 63-113 mR and the average value was 85 mR.

(by Guo Mingqiang [6751 2494 1730])

3. Radiation Monitoring During Reconstruction of the Heavy Water Research Reactor (by the Reactor Reconstruction Protection Group)

Our institute's heavy water reactor was shut down on 11 November 1978 for reconstruction, and cleaning began on 16 January 1979 (removal of all uranium slugs and control rods). More than ten high-radioactivity operations including dismantling and burial of the old vessel and installation of the new vessel, decontamination and overhaul of the heavy water circuits, disassembly, decontamination and overhaul of the three heavy water pumps, replacement of the two heat exchangers, and removal of sludge from the drain pond had been carried out by December 1979. The gamma radioactivity and energy spectrum of the old inner vessel of the reactor were determined on 5 June 1979 when it was hoisted out. The gamma dose at the upper opening of the vessel was 2.38 R/hr, the dose at the side 1.85 m from the central axis was 10.8 R/hr, and the dose 5 m from the axis was 1.14 R/hr. Conversion fives a total radioactive intensity of 30.9 Ci for the inner vessel, including a value of 21 Ci for ^{60}Co and 6.9 Ci for ^{65}Zn.

To decrease the internal and external doses received by the workers, we took the following main measures:

(1) drawing up a specific plan for protection against radiation in highly radioactive operations;

(2) estimating the dose which the workers were likely to receive during each main operation and the main problems which should be given attention;

(3) maximum possible use of remote control and automatic operation, such as automatic electric sawing of the channels and the like;

(4) chemical decontamination and partial shielding of the heavy water system;

(5) strict separation into zones and timely monitoring and decontamination of the work area;

(6) strict control of worker time spent in high-radioactivity areas;

(7) intensified work area ventilation;

(8) technical training and testing of operators, including a full-scale dry run with the inner vessel, the protective cover and the like;

(9) in order to protect highly trained personnel from being the only ones to carry out operations involving high levels of radioactivity, we organized a group of non-radioactive area workers or workers who ordinarily were not involved with high-radioactivity operations to do auxiliary work such as decontamination, sludge removal, transport of wastes and the like.

A. Individual Dose Monitoring

Some 199 workers took part in the overhaul and reconstruction of the reactor, and the total annual collective equivalent gamma ray dose was 108.0 man-rem, giving an average annual equivalent dose of 0.54 rem. Two workers received rather large equivalent gamma ray doses: 2.2 rem in one case and 2.17 in the other.

Internal irradiation monitoring methods included determination of tritium and total beta in the urine and whole-body counts. The tritium and total beta determination results are shown in Table 13 and the results of total body counts for internal gamma emitters are shown in Table 14.

Table 13. Radioactive Nuclides in the Urine of Workers

nuclide	number of persons tested	testing results		reference level
		concentration range	no. of persons	
tritium	157	<0.1 $\frac{\mu Ci}{l}$	37	2 $\frac{\mu Ci}{l}$
		0.1—1 •	97	
		1—2 •	15	
		2—10 •	7	
		10—20 •	1	
total β	45	<2 $\frac{pCi}{24h\cdot urine}$	17	50 $\frac{pCi}{24h\cdot urine}$
		2—20 •	26	
		20—50 •	2	

Table 14. Whole-Body Gamma Emitter Results for Workers

nuclide	number of persons tested	testing results		max. permissible accumulation in body μCi
		concentration range, mcCi	no. of persons	
^{60}Co	78	<0.01	69	10
		0.01—0.1	9	
^{137}Cs	78	<0.01	78	30

It can be seen from Tables 13 and 14 that owing to the measures described above, most workers showed urine radioactive nuclide levels much lower than the reference levels, and only a very small number of workers had urine tritium levels 5-10 times as high as the reference levels. The accumulated quantities of gamma emitters (primarily ^{60}Co and ^{137}Cs) were all less than 1 percent of the maximum permissible values.

B. Monitoring in the Work Area

The highest tritium concentrations in the air were found in the heavy water pump room, followed by the reactor room; the annual average values were 2.5×10^{-9} Ci/liter and 1.5×10^{-10} Ci/liter respectively. The tritium concentrations in the air of the basement hall and first, second and third story halls were relatively low: all were 5×10^{-12} Ci/liter.

The concentration of beta aerosols in the air of the work area was consistently between 10^{-14} and 10^{-13} Ci/liter, but reached 10^{-12}-10^{-11} Ci/liter for brief periods during certain operations (such as disassembly of the heavy water pumps, decontamination of the water circuits and the like). The main radioactive nuclide was ^{60}Co.

C. Radioactive Wastes

The total quantity of tritium emitted through the smokestack for the entire year was 113 Ci, and the total quantity of beta aerosol discharged was 7.7 mCi.

The amount of highly radioactive wastewater discharged was 38 tons, including a total beta radioactivity of 144.8 Ci, and 231.2 Ci from tritium. This radioactivity resulted primarily from decontamination of the heavy water circuit. The total quantity of weakly radioactive wastewater discharged was 97.2 tons, containing 0.75 Ci of total beta and 1.8 Ci of tritium. There were 9 barrels (0.1 m^3 each) of strongly radioactive sludge; the gamma radiation rate on the outer surface of the barrels was 0.9 to 1.8 R/hr, and the relative radioactivities of the sludge were: 1.7 mCi/kg of ^{60}Co, 4.3×10^{-2} mCi/kg of ^{137}Cs, and 3.1×10^{-2} mCi/kg of ^{144}Ce.

The total quantity of strongly radioactive solid waste produced over the year was 10 cubic meters, and the total quantity of weakly radioactive solid waste was 58 m^3; this waste was stored in a waste storage facility.

D. Problems

1. Because there were no special protective facilities, the heavy water pumps were placed in an area of the reactor room for overhaul (a cement wall 1.8 m high was placed around the pumps), resulting in serious contamination of the overhaul area and the surrounding wall. In the future such operations will be carried out in a special overhaul area.

2. Contamination of working clothes and footwear usually exceeded permissible levels, and plans have been made to provide replacements after complete decontamination of the work area.

(by Pan Ziqiang [3382 5261 1730],
Jiang Xiwen [1203 1585 2429] and
Chun Yuqing [2504 3768 0615])

4. Surveys of ^{131}I and ^{125}I Contamination of Plants in the Vicinity of the Institute of Atomic Energy Research and Determination of Relative Parameters

In 1979 a survey was made of ^{131}I and ^{125}I contamination of plants in the vicinity of the institute. The methods were as follows: the day after production of ^{131}I and ^{125}I, at 16 locations within 20 km of the smokestack, following low-level background gamma spectroscopy and radiochemical concentration, low-level background beta emission monitoring equipment and X-ray spectrometers were used to determine the intensity of contamination of plants by ^{131}I and ^{125}I respectively. Figures 13 and 14 show ^{131}I contamination in July and August.

The main data on ^{131}I and ^{125}I contamination are given in Tables 15 and 16. When ^{131}I was produced, the ^{131}I contamination of plants was the highest, gradually dropping off, and manifesting cyclic changes in accordance with the production of ^{131}I. The ^{125}I level showed a month-by-month increase at short distances.

In the specific emission conditions of our institute, the apparent half life of ^{131}I in plants was 7.4 days, and the washing factor (after washing/before washing) was 0.60 to 0.80. Agricultural crops which had a long growing period in the contaminated areas had ^{131}I and ^{125}I levels in their fruits equivalent to about 10 percent of the levels on the leaves.

Because of the nonuniform discharge of ^{131}I during the production process, a determination of the correlation between the process flow and ^{131}I discharges was made. It was found that when acidic distillation residues were directly discharged into the high-radioactivity piping after production, ^{131}I concentrations were two orders of magnitude higher than in discharge during other procedures, and when the iodine isotope production shop temporarily stored its distillation residues in a relatively well sealed plastic barrel, the total quantity of ^{131}I discharged into the environment showed a rather marked decrease.

Table 15. Main Aspects of ^{131}I Contamination During July-September

month	main contamination direction	distance to point of max. contamination,	max. contamination, 10^{-9} Ci/kg	max. distance at which contamination is 1×10^{-12} Ci/kg
7	SSW	1600 meters	4.57	15
8	NNE	600	16.20	25
9	NNE	400	8.11	20

Table 16. Main Aspects of ^{125}I Contamination

month	main contamination direction	distance to point of max. contamination	max. contamination, 10^{-9} Ci/kg	max. distance at which contamination is 1×10^{-12} Ci/kg
7	NNE	200 meters	2.06	
8	NNE	200	4.66	20
9	NNE	400	12.8	20
10	NNE	600	10.2	

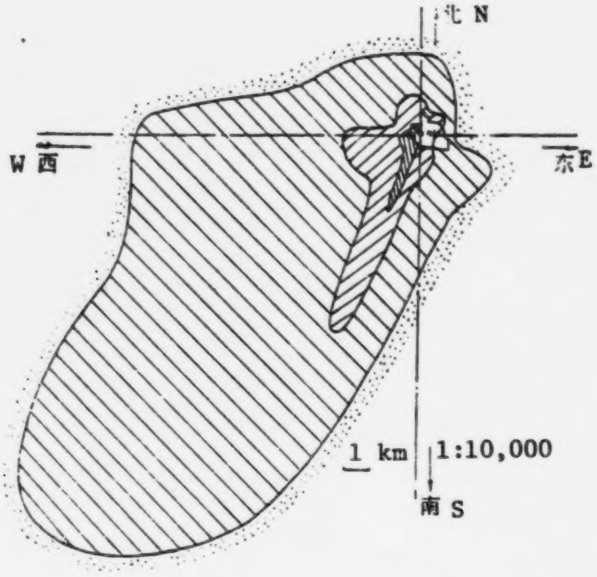

北 N
W 西
东 E
1 km
1:10,000
南 S

Figure 13. ^{131}I Contamination in July (see legend of Figure 14b).

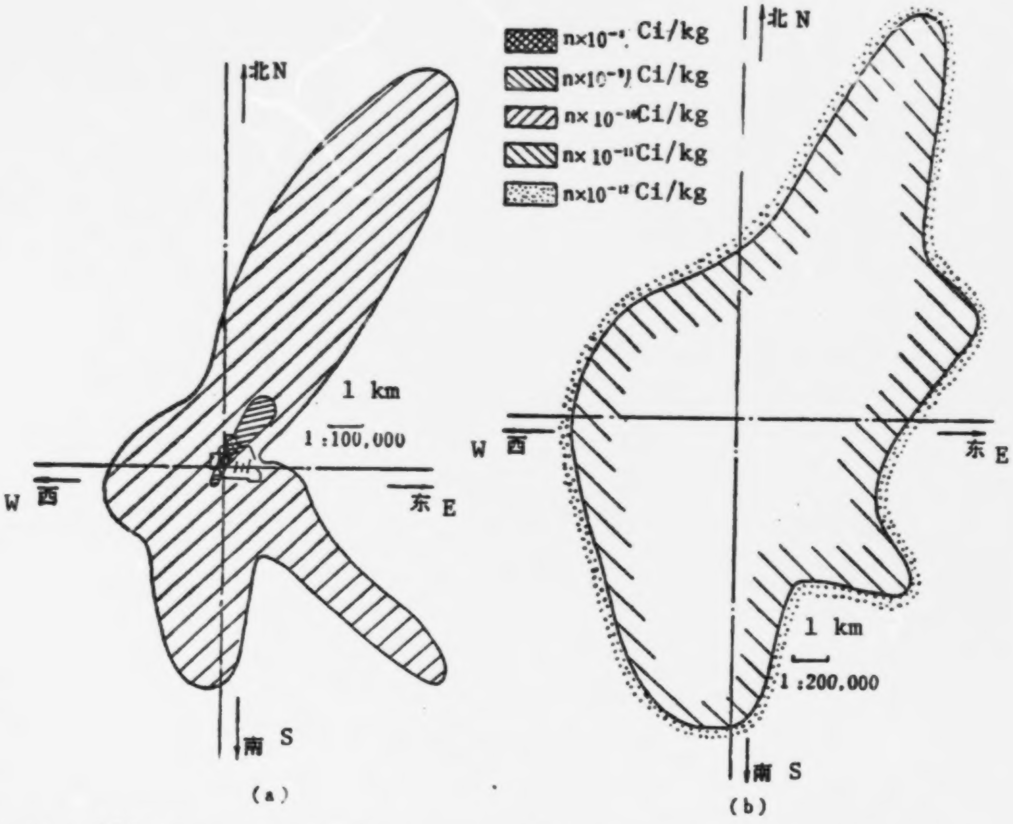

n×10⁻⁸ Ci/kg
n×10⁻⁹ Ci/kg
n×10⁻¹⁰ Ci/kg
n×10⁻¹¹ Ci/kg
n×10⁻¹² Ci/kg
北N
W 西
东 E
1 km
1 :100,000
南 S
(a)
北 N
W 西
东 E
1 km
1 :200,000
南 S
(b)

Figure 14. ^{131}I Contamination in August (for legend, see part b).

(by Xie Yunmian [6200 6663 2758])

8480
CSO: 8111/1423

LIFE SCIENCES

SELENIUM DEFICIENCY SAID CAUSE OF KESHAN DISEASE

Shanghai WENHUI BAO in Chinese 13 Jul 81 p 1

[Article: "Our Nation's Medical Workers Made a Major Discovery After Many Years of Research; Deficiency of Selenium Is a Cause of Keshan Disease; The Important Function of Selenium in Human Health Is Demonstrated Internationally for the First Time"]

[Text] Our nation's medical workers discovered that selenium deficiency is a cause of Keshan disease which is very harmful. This new achievement has opened up a road for the effective prevention and control of Keshan disease and it has also proven for the first time internationally that selenium is a necessary trace element in the human body, therefore it has received high evaluation and attention by experts of other nations.

Keshan disease is a regional myocardial disease widely distributed in farm villages in 15 provinces and regions of Heilongjiang, Jilin, Shaanxi and Yunnan. Patients are mostly children and women, the death rate is very high. Because the cause of the disease is not clear, there has not been any specially effective method of prevention and treatment.

After Liberation, the party and the government paid a lot of attention to prevention, treatment and research of Keshan disease. Several national academic meetings were held to discuss the subject and specialized agencies were established in each region where the disease was found to carry out comprehensive measures to actively prevent and control it. Comrade Zhou Enlai, when he was alive, sent Beijing's medical specialists of leading medical teams to the regions severely affected by the disease many times. He also personally instructed that "we should clearly understand the cause of Keshan disease."

For several decades, the medical circle studied Keshan disease from many aspects, and some people proposed the theory of poisoning, infection and malnutrition but these theories were never fully proven. In the 1960's, Xian Medical Academy and the Chinese Academy of Medical Sciences obtained preliminary results using sodium selenite in tests of a few patients to prevent Keshan disease. This caused them to notice the relationship between selenium and Keshan disease. After 1974, the Keshan disease research and treatment squad of the Chinese Academy of Medical Sciences and the Xian Medical Academy cooperated with over ten provincial units throughout the nation and conducted large scale research in the preventive effects of sodium selenite for 7 consecutive years. Some 12,000 tested patients were strictly observed and compared and it was proven that using sodium selenite could reduce the percentage of occurrence of Keshan disease by 85 percent and the death rate could be reduced by over 88 percent. At the same time, they made 10,000 selenium content measurements in samples of food grains, human blood, hair and urine in the regions of the disease and proved that the regions of the disease were all regions of low selenium. The residents in the regions of the disease were all in a state of selenium deficiency. After taking sodium selenite, the selenium content in the bodies of those in the regions where the disease was found was increased to that of those in regions without the disease, and the related metabolic functions of the human body improved.

According to preventive research in large areas and massive scientific data of the inner environment, medical workers proposed that selenium deficiency is a cause of the occurrence of Keshan disease and selenium is a trace element needed by the human body. This was the first international revelation of the important function of selenium in the health of the human body. It overturned the view that selenium is a poisonous substance which cannot be used in the human body and turned selenium research from animals to people. At the second international conference on the function of selenium in medicine and biology held last year, this observation of Chinese medical workers was confirmed by specialists of all nations.

Trace amounts of the element selenium has brought good news to the people of the regions of the disease. Up to the present, over 1.5 million people in the 15 Keshan disease regions throughout the nation have used the method of supplements of selenium to prevent Keshan disease and visible results have been obtained. The number of patients suffering from Keshan disease in Heilongjiang, the key region of Keshan disease, has dropped year after year. In 1979, there were 386 patients, in 1980, the number dropped again to 176, a great reduction from the past. At the locality where Keshan disease was discovered--Keshan county--there were only two patients last year.

9296
CSO: 4008/424

AUTHOR: YU Guocong [0151 0948 3827]
GU Fangzhen [7357 5364 3791]

ORG: Both of the Department of Chemical Engineering, Tianjin University

TITLE: "Simulation and Efficiency of Large Tray (II)--Two Dimensional Fixed Number Mixing Pool Model"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 97-110

TEXT OF ENGLISH ABSTRACT: A new mathematical model of the mixing pool type is proposed to simulate the fluid flow and mass transfer behavior in a large tray. In the proposed model, the whole tray deck is divided into a number of square (or rectangular) compartments or mixing pools, each of which is assigned to have adjustable flow and backmixing in both the z (along the main flow path) and w (perpendicular to the main flow path) directions. The chief features of the present model are: (1) It is a two-dimensional model instead of the usual one-dimensional so that more complicated actual flowing conditions obtained from the hydrodynamic study in the large tray can be closely simulated by adjusting the flow among the mixing pools in both the z and w directions. (2) Since backmixing is taken into account, the number of mixing pools in a tray can be fixed instead of varied as is the case in the conventional mixing pool model; thus, the application of matrix computation is possible. (3) The present model can be reduced to other tray models depending on the number of mixing pools to be chosen in each direction.

[Continuation of HUAGONG XUEBAO No 2, Jun 81 pp 97-110]

The application of the present model to prediction of the liquid phase concentration profiles and Murphree efficiencies in a tray with complicated flow pattern and velocity distribution, as observed in our experimental study, is demonstrated. The effects of the liquid flow rate, non-uniform velocity field, directional splashing and subsidiary flow are also investigated and discussed.

AUTHOR: SHEN Jingzhu [3088 7234 3796]
S. Kagei
N. Wakao

ORG: SHEN of the Department of Chemistry and Chemical Engineering, Qinghua University, China; Kagei and Wakao both of the Faculty of Engineering, Yokohama National University, Japan

TITLE: "Parameter Estimation by Fourier Analysis--Determination of Gas-particle Heat Transfer Coefficient in Packed Bed"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 111-123

TEXT OF ENGLISH ABSTRACT: A stimulus-response technique is used to determine gas-particle heat transfer coefficient in a packed bed. The input signal is a one-shot temperature impulse of arbitrary shape and at a distance downstream from the input point the temperature response is measured.

The mathematical model adopted for the packed bed is a one-dimensional heterogeneous dispersion-concentric model. The Laplace transform method is used in the solution of the partial differential equations of the model. As the resulting transfer function is too complicated, a Fourier analysis method is applied. The input and response signals are both expanded in Fourier series form. The Fourier coefficients of the response signal can be predicted directly from those of the

[Continuation of HUAGONG XUEBAO No 2, Jun 81 pp 111-123]

input signal and the transfer function and thus the calculated response signal function is obtained, which can then be fitted with the measured one to carry out the parameter estimation. In the procedure of curve fitting the mean square deviation between calculated and measured response functions in the whole time domain is minimized.

It is found that the results of this work can be put into an expression assuming the same form of a known correlation of mass transfer

$$Nu = 2 + 1.1\ Pr^{1/3}Re^{0.6}$$

in which the Nusselt number Nu contains the gas-particle heat transfer coefficient determined. The result also shows that in the laminar flow regime the Nusselt number of gas-particle heat transfer does not decrease appreciably with the decrease in the Reynolds number.

The experimental equipment is also described in the paper.

AUTHOR: HUANG Ningbao [7806 1380 1405]
GUO Zhuifu [6665 6361 2105]
LU Zhongming [0712 0112 2494]

ORG: All of the Research Institute of Nanjing Chemical Industry Company

TITLE: "The Kinetic Performance of Ammonia Synthesis Catalyst A110 under the Effect of Trace Water Vapor"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 125-134

TEXT OF ENGLISH ABSTRACT: This paper discusses the investigation on the effect of reactive activity of quadruply promoted ammonia synthesis catalyst A110 by using a synthesis gas containing $< 5 - \sim 30$ ppm water vapor under high pressure. The experimental data were treated with the modified T-P equation. We have found that the poisoning factor $POIS = k/k_{T0}$ is approximately in inverse proportion to $\sqrt{V_{H_2O}}$ and proportional to the sixth power of absolute temperature, and is minimally related to pressure.

The catalysts appeared to be inflicted by poison when the water vapor reached $P_{H_2O}/P_{H_2} \cong 10 \times 10^{-6}$. The intrinsic apparent energy of activation rose from 38,000 kcal/kg-mol to 40,000 kcal/kg-mol or higher as the amounts of water vapor poisons increased. In comparison with the catalysts' original intrinsic activities,

[Continuation of HUAGONG XUEBAO No 2, Jun 81 pp 125-134]

appreciable change of kinetic performance under poisoning conditions, especially in the lower temperature region, has been acquired.

After 15 days of repeated poisoning experiments it is discovered that most of the catalytic activity has been recovered, but a certain degree of its activity was permanently destroyed by the poison.

Calculation of the empirical correlations of the poisoning factor of trace water vapor has been procured.

AUTHOR: ZHAO Shuzhen [6392 3219 3791]
LU Yuanduo [4151 0337 6995]
JIN Jinrong [7246 6855 2837]

ORG: All of Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

TITLE: "A Study on Lead Dioxide Electrode--Composite $PbO_2/Sb-SnO_2/Ti$ Anode"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 135-140

TEXT OF ENGLISH ABSTRACT: A new composite PbO_2/Ti anode with an interlayer of Sb-doped SnO_2 was prepared. The resistivity and components of the interlayer were determined by the four-probe method and X-ray diffraction respectively. Comparisons of the contact resistance and operating life of the PbO_2 electrodes with and without the interlayer showed that the composite $PbO_2/Sb-SnO_2/Ti$ electrode was good in performance and can be used for practical purposes.

AUTHOR: LIU Yuming [0491 6877 6900]
JIANG Linzong [1203 2651 1350]

ORG: LIU of the Shanghai Research Institute of Chemical Industry; JIANG of the Shanghai Shuguang Chemical Works

TITLE: "Study on the Radiation-induced Bulk Polymerization of Chlorotrifluoroethylene--The Effect of Radiation Conditions on Polymerization Progress and Zero-strength Temperature of Polymers"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 141-150

TEXT OF ENGLISH ABSTRACT: The effect of radiation conditions on the polymerization progress and zero-strength temperature (ZST) in the radiation-induced bulk polymerization of chlorotrifluoroethylene is presented in order to bring to light the regularity by which high quality products may be prepared.

When changing the dose (D), dose rate (I) and radiation temperature (T), the kinetic progress remains smooth.

One of the principal factors for controlling the product quality, i.e., ZST, has been especially discussed and a relation between the factors affecting ZST is obtained. This relation provides the basis for the selection of conditions for preparing products with various properties:

[Continuation of HUAGONG XUEBAO No 2, Jun 81 pp 141-150]

when $t \leqslant 20^{\circ}C$, $ZST = 1.75 \cdot 10^{-2} \cdot T^{0.9} \cdot I^{-0.39} \cdot D^{0.39}$;
when $t \geqslant 20^{\circ}C$, $ZST = 4 \cdot 10^{8} \cdot T^{-3.3} \cdot I^{-0.36} \cdot D^{0.39}$.

The test results testify that the products from the bench-scale experiment have good thermal stability, excellent mechanical properties, reproducible quality and high purity. The technological process is simple.

AUTHOR: CHEN Dachang [7115 1129 2490]
LU Lisheng [4151 0536 3932]
YE Chubao [5509 2806 1405]

ORG: All of Shanghai Research Institute of Chemical Industry

TITLE: "An Investigation of Fluid Dynamics and Characteristics of Mass Transfer in Corrugated Packing Made of Two Layers of Stainless Steel Gauze"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 151-156

TEXT OF ENGLISH ABSTRACT: This packing is a new high efficiency and regular packing. The use of two layers of stainless steel gauze gives good wettability and uniform liquid distribution over the entire packing surface so that the separation efficiency is increased sensibly even with liquids of high surface tension, such as water, and under low liquid loads.

Vacuum rectification tests of D_2O/H_2O system have been performed with a column of 10 cm inside diameter, packing height of 200 cm, and column top pressure about 125 torr. By using the measured data, satisfactory correlations for pressure drop and mass transfer of this packing were obtained, as stated in the article.

AUTHOR: TAN Qiu [6151 6669]
LI Xiyuan [2621 6932 3293]
LI Ana [2621 7093 1226]

ORG: All of the Chemical Engineering Department, Tianjin University

TITLE: "The Determination and Correlation of the Hydraulic Performance of Several Kinds of D_g50 Random Tower Packings"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 157-168

TEXT OF ENGLISH ABSTRACT: In this article, the pressure drop data at different gas velocities and flooding point data have been measured with the air-water system at different irrigating rates for 11 random tower packings of D_g 50 mm. We found some disadvantages in J.S. Eckert's method and think that it is not suitable for use as the foundation for further modification.

Based on the research done by our predecessors, we have, in this article, suggested two new equations, one for calculating the flooding velocity,

$$W_F=0.003642\left(\frac{\gamma_L^{0.7}}{\gamma_G^{0.5}\mu_L^{0.2}}\right)(\sqrt{a}\cdot d_p^{0.25}-0.1548L^{0.47})^2$$

and the other for calculating the pressure drop

[Continuation of HUAGONG XUEBAO No 2, Jun 81 pp 157-168]

$$\Delta P=\frac{mY}{1-nY}$$

where

$$Y=\frac{W(\gamma_G^{0.5}\mu_L^{0.2}\gamma_L^{-0.7})}{(\sqrt{a}\cdot d_p^{0.25}-0.1548L^{0.47})^2}$$

which has successfully correlated our data and obtained the characteristic value--form coefficient α and pressure drop constant m, n for 11 kinds of packing.

AUTHOR: JIN Zhangli [6855 1757 4409]

ORG: Beijing Institute of Chemical Technology

TITLE: "Calculation of Vapor-Liquid Equilibria for Systems of n- and iso-butanol Purification Process by UNIFAC--Supplement of Group Interaction Parameters, a $a_{CCOH, CHO}$ and $a_{CHO, CCOH}$"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 169-177

TEXT OF ENGLISH ABSTRACT: In this work, a pair of group interaction parameters, $a_{CCOH, CHO}$ and $a_{CHO, CCOH}$, used in the UNIFAC group contribution method, has been supplemented with experimental vapor-liquid equilibrium data of iso-butanol iso-butaldehyde system available from the literature. The UNIFAC method has been used in phase equilibrium calculations for systems of n- and iso-butanol purification processes with accuracy approaching or attaining that of results calculated by NRTL and other correlations. In view of the fact that the UNIFAC method is based on the assumption of the additive property of group properties, it is necessary to check the calculating results with a few experimental data and to make appropriate choices of the available group parameters.

AUTHOR: DENG Kejia [6772 0668 0857]

ORG: Chengdu University of Science and Technology

TITLE: "Mathematical Proof of the Second Law of Similitude Theory"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 179-186

TEXT OF ENGLISH ABSTRACT: The three laws of similitude theory are the essence and center of the whole theory. This paper presents the second law of similitude theory, or the π-theorem, a mathematical proof.

The method and steps adopted here for proof fit well to the π-theorem both in functional analysis and dimensional analysis.

AUTHOR: ZHANG Songlong [1728 2646 7893]
JIN Huanlong [6855 3562 7893]
GE Yaodian [2047 5069 3329]

ORG: All of the Chemical Machinery Research Institute

TITLE: "An Application of High-speed Magnifying Photography on the Model Test of an Industrial Burner"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 2, Jun 81 pp 187-191

TEXT OF ENGLISH ABSTRACT: High-speed magnifying photography is an economical non-intrusive measurement method. It can be used to measure the droplet size in flight. This paper describes the measurement theory, experimental devices and measurement results of this technique used for the determination of droplets atomized by an industrial burner.

For this test, the sauter mean diameters measured by the industrial burner are 58 microns at 400 mm section and 62 microns at 500 mm section respectively.

The test results are satisfactory, with relative error less than 8 percent. The minimum measurable droplet size is 12μ.

9717
CSO: 4009/375

Engineering Thermophysics

AUTHOR: YANG Donghua [2799 2639 5478]

ORG: Shanghai Institute of Chemical Technology

TITLE: "Analysis of Thermal Engineering Problems by Exergy"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 1-7

TEXT OF ENGLISH ABSTRACT: In this paper the author attempts to solve thermal engineering problems by the exergetic method as follows:
1. First of all, four more definite and clearer definitions of exergetic efficiency are presented. Then, separate definitions of reasonable exergetic efficiency are also given for the different kinds of thermal engineering equipment for different uses.
2. Emphasis is placed on the analysis of exergy of the steady flow process with perfect gas as the working substance. From such an analysis it is shown that the exergy of a steady flow process of perfect gas can be divided into two different kinds of capabilities of work exclusive of the constant-zero exergy e_0, which characterizes the difference in mass transported between the steady flow and the surrounding medium. Now the steady flow process in a fluid machine with perfect gas as the working substance can be described by stagnation enthalpy exergy e_i^* and stagnation pressure exergy e_p^* instead of stagnation enthalpy i^* and stagnation pressure p^*. The two different kinds of capability of work can be

[Continuation of GONGCHENG REWULI XUEBAO Vol 2 No 1, Feb 81 pp 1-7]

distinguished and eventually a further development of exergetic analysis can be brought about.
3. The objective function of the thermal engineering equipment is depicted by exergetic efficiency so as to examine whether more reasonable results can be reached with other than the traditional approach of analysis through this objective function--thermal efficiency. According to the author, this will depend on the coherence of variation of exergetic efficiency against the parameter analyzed with thermal efficiency. If the coherence does not appear, more reasonable results can be obtained. Otherwise they will never be obtained.
4. As for the exergetic analysis of a weak part where improvement should be made, through use of an example it is shown that the weak part can only be determined correctly by the following approaches:
(1) By comparing the magnitudes of exergy losses for various parts of given equipment;
(2) By comparing the magnitudes of exergy losses for the same part of different kinds of thermal engineering equipment;
(3) By rigorously distinguishing two different kinds of exergy losses, i.e., stagnation enthalpy exergy losses and stagnation pressure exergy losses.

AUTHOR: LI Tianduo [2621 1131 6995]

ORG: Department of Thermal Engineering, Qinghua University, Beijing

TITLE: "Mathematical Model of the Evaporating System with Natural Circulation"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 8-13

TEXT OF ENGLISH ABSTRACT: A multivariable mathematical model of the evaporating system with natural circulation is derived. This model, which consists of several lumped-parameter sections, is based on the linked use of linear and quasilinear ordinary differential equations with algebraic equation sets, and is suitable for real-time digital simulation of the transient behavior of such a system over large operational ranges. Most of the results correlate well with field tests.

AUTHOR: HONG Daiji [3163 6649 0679]

ORG: Zhejiang University

TITLE: "Dual Heat Source Steam Cycle--A Power Plan of Combined Solar and Fuel-burning Heat"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 14-16

TEXT OF ENGLISH ABSTRACT: A new steam cycle for an electric station which utilizes combustion gas as a high temperature heat source and solar heat collected by the fixed tilt solar collector as a low temperature heat source is proposed. The main purpose of this paper is to promote the utilization of solar heat so as to save fossil fuel.

AUTHOR: LING Zhiguang [5677 1807 0342]
LI Shulian [0632 2885 1670]
GE Manchu [5504 3341 0443]

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Some Problems in the Aerodynamic Design of Energy Recovery Particulate Gas Turbines and Analysis of Test Results"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 17-19

TEXT OF ENGLISH ABSTRACT: After a brief description of the phenomenon of particulate gas flow in turbine blade passage, the fundamental equations of two-phase flow are derived based on a two-velocity model. If the particle size and concentration are small, the simplified one-velocity model leads to an equation similar to that of pure gas flow except for the equivalent density. The aerodynamic design considerations of such turbines are then discussed, and test results with some analysis are given.

AUTHOR: YAN Ruqun [0917 3067 5028]
QIAN Zhaoyan [6929 5128 8827]

ORG: Both of the Engine Department, Northwestern Polytechnical University

TITLE: "Theoretical Investigations and Experimental Research for Higher Subsonic Two-dimensional Compressor Cascade"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 20-27

TEXT OF ENGLISH ABSTRACT: The losses occurring in the air flow of a compressor cascade are mainly controlled by the developing and separating of the boundary-layer on the surfaces of the blade. Therefore, by means of adapting the theory of a compressible turbulent boundary layer, utilizing some characteristic parameters, such as momentum thickness, form factor, energy factor and other combination parameters, and then determining the flow model of simple power of velocity distribution in the wake behind the cascade, a simplified calculating equation for total pressure loss coefficient of subsonic and transonic cascades of the compressor is derived. The basic calculating equation derived would be used for predicting the total pressure losses of both design condition and off-design condition of the compressor cascade.

In this paper a new curvilinear method for correcting the gaseous compressible effect under higher subsonic and transonic intake conditions upstream of the cascade

[Continuation of GONGCHENG REWULI XUEBAO Vol 2 No 1, Feb 81 pp 20-27]

is presented. According to this basic equation, the total pressure losses for a given compressor cascade are calculated, and then tested on the plane wind tunnel under various conditions, with both results being in better agreement than previously.

AUTHOR: None

ORG: Aerodynamic Laboratory, Beijing Heavy Electrical Machine Works

TITLE: "The Shock Wave Structure and Analysis of the Flow through Transonic Turbine Cascade"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 28-34

TEXT OF ENGLISH ABSTRACT: Through a lot of Schlieren photos from the aerodynamic experiments of the transonic turbine cascade, the mechanisms of the generation and development of the shock waves in the channel and exit flow field of the cascade are studied. In these photos, there is a series of deflected shock waves from the free boundary of the jet. Through the analysis of this physical phenomenon, a satisfactory explanation of the aerodynamic performance which has a multipeak type of curve is obtained. In the third part of this article, three types of interaction between shock waves and the boundary layer are observed and discussed simply.

AUTHOR: XU Jianzhong [1776 1696 0022]
JIANG Zuoren [1203 0155 0088]
YANG Jinsheng [2799 6855 3932]
et al.

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Theoretical Analysis of the Stream Surface of Revolution with Supersonic Inlet Flow in a Transonic Axial Compressor"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 35-42

TEXT OF ENGLISH ABSTRACT: Starting from jumps of absolute velocity and its tangential component due to changes of magnitude and direction of the relative velocity while passing through a shock and using the relations for a plane oblique shock, the expressions for $\Delta(V_\theta r)$ loss and total pressure ratio of gas are derived and the fact that the gas is supercharged across the shock is explained theoretically. An aerothermodynamic analysis of the stream surface of revolutions with supersonic inlet flow is made by assuming the location and shape of the passage shock and applying the characteristic method in the inlet region. Some of the important features in a transonic compressor can be seen from the analysis. The moment of velocity from such calculations is close to that given in the calculation of inverse

[Continuation of GONGCHENG REWULI XUEBAO Vol 2 No 1, Feb 81 pp 35-42]

problems along a central S_2 stream surface. There are great differences in the Mach number distribution between the calculations of the central S_2 stream surface with the $V_\theta r - \Delta s/R$ variations and the stream-filament thickness, in which the shock relations are taken into account as input, and of the conventional average S_2 stream surface.

AUTHOR: ZHANG Baodong [1728 0202 2767]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "The Effects of Trailing Vortex in Subsonic Rotor"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 43-45

TEXT OF ENGLISH ABSTRACT: This note presents a formula accounting for the effects of a trailing vortex in an annular duct rotor. The numerical example at $M_z = 0.5$, $M_t = 0.9$ and pb $\neq 1$ vividly indicates the streamline shifts caused by existing trailing vortices. Calculation also points out that the performances of an original rotor would be spoiled by cutting the blades.

AUTHOR: HAN Yinda [7281 1377 6671]
WANG Kexiang [3769 0344 4382]
YU Guangrong [0151 0342 2837]

ORG: All of the Chinese Aerodynamic Research and Development Center (CARDC)

TITLE: "Primary Research on Ablation Experiment Technique of the Turbulent Flow over a Flat Plate Specimen"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 46-52

TEXT OF ENGLISH ABSTRACT: A new method utilizing a flat plate specimen placed at a small angle to a supersonic arc heated flow has been developed. This method can surmount the disadvantages of the usual pipe test method. Its observable recession rate is relatively uniform, and surface temperature and radiant heat flux can be easily performed.

This paper presents the experiment principles, the configuration of the facility, and the measurement and theoretical calculating method of the parameters. The study was accomplished with measured reservoir pressures ranging from 10.2 to 17.3 kg/cm^2 and total enthalpies from 520 to 2440 kcal/kg. Under five turbulent conditions the ablation test results of teflon models are given.

AUTHOR: YAN Dimin [7346 6611 3046]
XU Guohua [6079 0948 5478]

ORG: Both of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "Effect of Sinusoidal Heat Flux Distribution and Double-side Heating on Heat Transfer Coefficient in Annuli"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 53-59

TEXT OF ENGLISH ABSTRACT: In this paper the experimental investigation of turbulent heat transfer to air in annuli is described, the effect of sinusoidal heat flux distribution and double-side heating on heat transfer coefficients is analyzed, and corresponding empirical correlations are presented. In addition, the superposition principle is applied to annuli heat transfer calculations and the heat transfer coefficient correlation for axially varying heat flux is obtained. Calculation results show good agreement with our experiment.

AUTHOR: WU Wendong [0702 2429 2639]
GAO Lijun [7559 7787 0689]

ORG: Both of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Numerical Calculation of Laminar Flow and Heat Transfer in an Entrance Region of a Circular Tube with Uniform Heat Flux"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 60-66

TEXT OF ENGLISH ABSTRACT: To date, in order to predict velocity and temperature profiles in an entrance region of a circular tube with uniform flux, the integral method is usually utilized and, in general, the assumptions of fully developed flow and μ = constant are made. In this paper the method of numerical calculation is used. The calculation is carried out for μ = constant and $\mu = f(T)$ respectively. The velocity and temperature distributions on various cross sections and along the axis are obtained, as is the length needed for fully developed flow. The agreement of predicted results with experimental data is quite good. It is found that the variation of μ with temperature has great influence on the results.

AUTHOR: ZHENG Qiayu [6774 3174 0151]
WANG Yunshan [3769 0061 1472]

ORG: Both of the Thermal Energy Engineering Department, Qinghua University

TITLE: "Experimental Research on Combined Convective Heat Transfer Process of Turbulent Co-direction Flow Occurring in Vertical Annular Tube"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 67-69

TEXT OF ENGLISH ABSTRACT: According to the experiment results and analyses provided in this paper, the laminarization in the combined convective heat transfer process of the turbulent-natural co-direction flow is affirmed. The effects of Re and Gr (or Gr/Re^2) on the heat transfer process in such a combined convective condition are analyzed. The heat transfer correlations are given.

AUTHOR: LIN Haotao [2651 3352 3447]

ORG: Shanghai Power Plant Equipment Research Institute

TITLE: "Air Cooling in Turbine Rotors and Calculation of the Temperature Field of a Fir-tree Blade Root Assembly by the Finite Element Method"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 70-72

TEXT OF ENGLISH ABSTRACT: The finite element method is applied to find the temperature field of a fir tree blade root assembly, taking due account of the contact heat resistance. The application of finite elements to comply with the boundary condition of the second kind and the superposition of the pieces are discussed. The modified Crank-Nicolson method is used for transient temperature field problems. Finally some calculation examples are shown.

AUTHOR: GU Weizao [7357 4850 5679]
ZHANG Yuming [1728 3768 2494]
XU Hongkun [6079 7703 0981]

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "A New Method of Cooling Turbine Vane"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 73-75

TEXT OF ENGLISH ABSTRACT: In this paper the methods of augmentation of convective heat transfer in the cooling channels of the vane with rough surface and formation of the dynamic coating on the airfoil surface in virtue of silicon additives in the fuel are suggested. With these, the turbine inlet gas temperature could be raised to 1600 K when the coolant to gas flow ratio is 0.03 - 0.04.

AUTHOR: None

ORG: Teaching and Research Faculty of Combustion and Heat Transfer Engineering, Zhejiang University

TITLE: "Experimental Study of Dynamic Properties and Suitable Organization of Fluidized Bed Combustion Process for Low Grade Solid Fuels"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 76-82

TEXT OF ENGLISH ABSTRACT: In this article the experimental results of the dynamic properties of the combustion process of low grade solid fuels with broad distribution in a fluidized bed are preliminarily investigated. The suitable organization of the fluidized bed burning low grade solid fuels is also discussed.

AUTHOR: YE Jingwei [5509 4842 4885]
PAN Kuirun [3382 1145 3387]

ORG: Both of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Fuel Vaporizer"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 83-85

TEXT OF ENGLISH ABSTRACT: The function of the fuel vaporizer and its application to the automobile engine are discussed in this paper. For the purpose of improving the quality of fuel evaporation and engine economy, two types of fuel vaporizer are described and the related experimental characteristics are introduced.

AUTHOR: ZHANG Xuyi [1728 4872 4400]

ORG: Qinghua University

TITLE: "Desulfurization with Limestone in Fluidized Bed Combustion"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 86-88

TEXT OF ENGLISH ABSTRACT: Based on theoretical analysis, a concept that the efficiency of sulfur oxide absorption depends directly on the value of the reactive surface layer is proposed by the author. Experimental data correlates well with the theoretical analysis and a correlation describing the absorption process is introduced. By experiments, the weight fractions of the reactive surface layer of the granular limestone with definite diameters to their total weights are determined. It is found that the reactive surface layer of all the limestone granules remaining in the fluidized bed has almost the same thickness. This will enable the choice of the optimum size of limestone granules.

Experiments to improve the absorptivity of the fine limestone granules and the regeneration of used limestone granules are also discussed.

AUTHOR: ZHANG Qingfan [1728 7230 5672]

ORG: Nanjing Aeronautical Institute

TITLE: "Research on the Recirculating Flow Rate in the Wake of the Two-dimensional Flame Stabilizers (under Cold Conditions)"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 89-91

TEXT OF ENGLISH ABSTRACT: According to the turbulent jet theory, this paper presents a physical model for recirculating flow in the wake of the two-dimensional bluff-body flame stabilizers, and deduces a mathematical formula for evaluating flow rate. Through tests under cold conditions, the coefficient in the theoretical formula has been defined. The formula presented in the paper can be used for evaluating the recirculating flow rate of a two-dimensional flame stabilizer under cold conditions, with a blockage ratio of 0.2 - 0.4, and apex angle of $30\text{-}60^{\circ}$.

AUTHOR: TIAN Ziping [3944 1311 1627]

ORG: Shanghai Power Equipment Research Institute

TITLE: "The Effect of Coal Size on the FBC"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 92-94

TEXT OF ENGLISH ABSTRACT: The aerodynamic characteristics of varied sizes of coal in a fluidized bed are analyzed in this paper. The effects of coal size on the FBC's ignition burning process and combustion efficiency are investigated. The FBC mechanism is described from one side.

AUTHOR: CEN Kefa [1478 0668 3127]
XU Jisen [6079 0370 2773]
RU Haoliang [5423 3185 5328]

ORG: All of Zhejiang University

TITLE: "Investigation Measurement of Two-dimensional Flow with Application of Thermo-electrical Velocity Probe for Hot Environment"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 1, Feb 81 pp 95-97

TEXT OF ENGLISH ABSTRACT: In this article, a revolving hot element with directional shield for quick and automatic measurement of velocity and direction of two-dimensional flow (wind velocity 0-80 m/s, direction 0-360°, temperature 0-400°C) is proposed. A criterion equation for convective heat transmission of the hot element was obtained. The recording time for taking each reading is about 28 seconds. This method and instrument have been used in laboratory tests and on thermo-equipment.

9717
CSO: 4009/369

AUTHOR: ZHENG Changqi [6774 2490 0796]

ORG: Chongqing University

TITLE: "The Calculative Principle of Tooth Surfaces Contact Analysis for Spiral Bevel and Hypoid Gears"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 1-12

TEXT OF ENGLISH ABSTRACT: The calculative analysis for the driving contact process of spiral bevel and hypoid gear tooth surfaces by use of an electronic digital computer is an advanced technique recently derived. It can produce the decisive criterion for collecting the best parameters of gear cutting adjustment and design. M.L. Baxter introduced this method first, and called it "tooth surfaces contact analysis" (TCA).

This paper describes the mathematical procedures in which each item of the formulas of TCA is derived as well as the conjugate action principle of these calculations in any part; it also presents the fundamental formulas to calculate tooth bearing, V-H adjustment values and motion graph.

AUTHOR: WANG Xianshang [3769 0341 0006]

ORG: Chengdu Farm Machinery College

TITLE: "The Checking of the Dynamic Characteristics of Machine Tools"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 13-19

TEXT OF ENGLISH ABSTRACT: In accordance with control theory, some critical standards for checking the dynamic characteristics of machine tools are given in this articel which involve the stability and its richness, dynamic errors and characteristics of the transient process. The real time method used to check the characteristics of machine tools is also presented. In addition, the relationship between the critical values and structure factors is analyzed.

AUTHOR: LI Chunli [2621 2504 4539]
WU Dehai [0702 1795 3189]
DANG Guangyue [7825 1639 1878]

ORG: All of Qinghua University

TITLE: "The Investigation of Graphite Morphology and Structure in Cast Iron"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 20-27

TEXT OF ENGLISH ABSTRACT: The characteristics of the morphology and structure of the typical graphite (flake, spheroidal, vermicular) in cast iron have been investigated with scanning electron microscopy (SEM). The observation on the specimens treated with deep etching and thermal oxidation etching was carried out and results obtained were as follows:

1. The various classes of flake graphite (Classes A, B, C, D) consisted of flakes that were branched and interconnected. Since they belong to the same type of graphite, their growth primarily occurred in the [$10\bar{1}0$] direction, and was inhibited in the [0001] direction, following in the formation of flake graphite.

2. The spheroidal graphite may be obtained in cast iron treated with commercially pure magnesium, yttrium or cerium as well as industrially nodulizing agents. The formations of the spheroidal graphite in cast iron treated with magnesium were different in that the surface of this graphite was smoother and more rounded than

[Continuation of JIXIE GONGCHENG XUEBAO No 2, 1981 pp 20-27]

that treated with yttrium and cerium. The surface of the spheroidal graphite obtained with the industrially nodulizing agents was intermediate between the two other forms of the graphite.

It was observed in the thermal oxidation etching specimen that there was an annual ring structure in the spheroidal graphite. It was shown that the surface of the spheroidal graphite was of the (0001) plane of the graphite crystalline structure, and its growth was carried out from the center, along the [0001] direction.

3. The vermicular graphite was of an intermediate morphology between the flake and spheroidal. They were connected in the same eutectic cell. The growth mode of the vermicular graphite was intermediate between that of the flake and spheroidal, also.

AUTHOR: GUO Jianting [6753 1696 0080]
ZHOU Fuzhen [0719 4395 2182]

ORG: GUO of the Metals Research Institute, Chinese Academy of Sciences; ZHOU of the Shenyang Bicycle Plant

TITLE: "The Application of a Cast Cold Working Die Made of Cr12MoV Steel"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 28-32

TEXT OF ENGLISH ABSTRACT: When preparing cold working dies made of Cr12MoV steel it should usually be repeatedly forged in order to break the eutectic carbide and eliminate its segregation so that homogeneity of mechanical properties can be guaranteed and deformation or rupture can be avoided in heat treatment. A new precision casting process used in the bicycle industry has been developed to prepare cold working dies. It is not necessary to repeatedly forge to break the carbide or to anneal at high temperatures to dissolve it. Since a fine but hard eutectic carbide network is embedded in rather softer sorbite base, its wearability can be improved appreciably. This results in increasing its service life three times.

AUTHOR: CAI Ruixian [5591 4213 6343]
HAN Tongpu [7281 0681 6225]
DING Libo [0002 4409 0130]

ORG: CAI of the Chinese Academy of Sciences; HAN and DING both of the Changchun Machine Tool Plant

TITLE: "A Simplified Strength Calculation Method for Shrunken Disk-drum Type Rotor with Constant Outer Diameter and Analysis of Calculation Results"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 33-42

TEXT OF ENGLISH ABSTRACT: A simplified strength calculation method for shrunken disk-drum type rotor with constant outer diameter is presented and some typical calculation results are analyzed and summarized. The cause of bending of a gas turbine rotor has been determined by this method, even after long term operation with full rotation speed and full operating loading.

AUTHOR: GAO Yunwen [7559 0061 2429]

ORG: Dalian Railroad College

TITLE: "A Study of Calculating Method of Cutting Angles"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 43-52

TEXT OF ENGLISH ABSTRACT: The cutting angles on cutting tools are currently divided into stationary and dynamic conditions. The method of a like-state equation and rotations operation for calculating cutting angles are suggested in this paper. Therefore, the formula of three secant plane angles (1-2), (1-4), is reasoned out in the cutting three-side form and a table has been calculated. Then, the conditions are given for use of form two of the above method.

AUTHOR: HUANG Zhen [7806 4176]

ORG: Northeastern Heavy Machinery College

TITLE: "The Method of Successive Approximation of Link Length for the Position Problem of Complex Plane Link Mechanisms"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 68-76

TEXT OF ENGLISH ABSTRACT: The position analysis of plane mechanisms with many links is one of the most difficult problems in the theory of mechanisms and machines. All known methods of solving this problem are very complicated since we must solve a set of nonlinear or trigonometric equations with many variables. This paper presents a simpler "method of successive approximation of link length" to determine the positions of Assur's three arm group. This method may also be extended to the solution of the more complex groups.

The method is simple and convenient, and the solution to this problem can reach any given accuracy level. Finally, as an example, all 24 positions of a 13-link mechanism with varied construction are obtained by this method on a digital computer.

AUTHOR: WANG Hongjing
et al.

ORG: None

TITLE: "The Conditions for Steady Revolutions of the Diesel Engine and Methods for Controlling Unsteady Revolutions"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 77-84

TEXT OF ENGLISH ABSTRACT: The problem of unsteady revolutions of the diesel engine is a complicated one. This paper discusses the problem from the point of view of vibration theory. In this paper the equation of motion is established and the equation of judgment of steadiness is also developed. According to these equations, due explanations are given for the reasons for unsteady revolutions, some complex phenomena are analyzed theoretically and some methods for controlling unsteady revolutions are offered. This paper is unusual in its discussion of the problem of unsteady revolutions of diesel engines, hence it is of great value for reference. It is published here as a basis for further discussions.

AUTHOR: WANG Bonian [3769 0130 1628]
et al.

ORG: WANG of the Zhenjiang Farm Machinery College

TITLE: "Research on and Application of Laminar Flowmeter"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese No 2, 1981 pp 85-96

TEXT OF ENGLISH ABSTRACT: From the analysis of pulsating flow, it is shown that the direct application of a flowmeter to the pulsating fluid flow measurements must meet two conditions, namely, the velocity must be proportional to the measured parameter and the reading of the measured parameter must be the mean value of time. To attain these two conditions, the laminar flowmeter depends on the laminar element, consisting of a number of narrow passages, and the measuring pressure tube with damping element.

The choice of structure types of laminar elements, the design method of the laminar flowmeter and the laminar element process are discussed in detail. The upper limit values of the Reynolds number Re and Re $\frac{d_d}{l}$ (d_d--equivalent diameter, l--the length of the element) are very important parameters for holding the linear relation between the velocity and pressure drop in the measuring range. For establishing the standard characteristics and using the laminar flowmeter more accurately, formulas are necessary.

[Continuation of JIXIE GONGCHENG XUEBAO No 2, 1981 pp 85-96]

The D-100 laminar flowmeter designed by the authors was tested on the 195, 295 and 395 diesel engine test beds. The reading errors of this laminar flowmeter applied directly to measuring the pulsating mean air flow are less than 1~2 percent when compared with the readings by using the plenum camber (damping pressure pulsating box). Therefore, the laminar flowmeter is simple and effective for pulsating mean flow measurements.

9717
CSO: 4009/364 END

JPRS 78996

16 September 1981

China Report

SCIENCE AND TECHNOLOGY

No. 127

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 78996

16 September 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 127

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Shanghai Optics, Fine Mechanics Institute Holds Symposium (Zhang Zechun; JIGUANG, No 5, 1981) 1

Institute Reports Progress in Laser Crystal Research (Zhang Ying; JIGUANG, No 5, 1981) 3

First Fiber Optics Communications Line Installed in Nanjing (Xu Qisan; XINHUA RIBAO, 7 Jul 81) 6

Developments in Computer Technology Reported (JISUANJI SHIJIE, 5 Aug 81) 8

Scale Model Plans May Answer Questions on Qiang-5 Aircraft (HANGKONG ZHISHI, Aug 81) 10

LIFE SCIENCES

Population Forecasting Models, Predictions Discussed (Song Duan Yu, et al.; ZIRAN ZAZHI, No 4, 1981) 13

PUBLICATIONS

Table of Contents of 'TIANWEN XUEBAO' Vol 22 No 2, 1981 23

Table of Contents of 'JICHE DIANCHUANDONG' No 2, 1981 25

Table of Contents of 'HE JISHU' No 3, 1981 26

Table of Contents of 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' No 3, 1981 28

Table of Contents of 'JISUANJI XUEBAO' Vol 4 No 4, 1981 31

Table of Contents of 'HUAXUE TONGBAO, No 6, 1981 33

Table of Contents of 'JIANZHU XUEBAO' No 6, 1981 35

ABSTRACTS

ENGINEERING THERMOPHYSICS

GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] No 2, May 81 37

IRON AND STEEL

GANGTIE [IRON AND STEEL] No 5, 1981 39

LASERS

JIGUANG [LASER JOURNAL] No 6, Jun 81 45

NONFERROUS METALS

YOUSE JINSHU [NONFERROUS METALS] No 2, 1981 47

SHIPBUILDING

ZHONGGUO ZAOCHUAN [SHIPBUILDING OF CHINA] No 3, Jul 81) 55

APPLIED SCIENCES

SHANGHAI OPTICS, FINE MECHANICS INSTITUTE HOLDS SYMPOSIUM

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8, No 5, 1981 p 27

[Article by Zhang Zechun [1728 3419 4783]: "Shanghai Institute of Optics and Fine Mechanics Holds Fourth Science Symposium"]

[Text] The Shanghai Optics and Fine Mechanics Institute held its fourth science symposium 25 to 27 March 1981. The symposium improved its past method of preselection of papers and reports. The institute's academic committee followed the following principles in reviewing the 167 reports submitted to the symposium and selected 130 papers. It did not select reports that had been published in the various types of academic journals at home and abroad or reports that had been presented at evaluation conferences or various academic conferences held at home or abroad. The reports selected possessed a definite academic standard or applicable value; each person was limited to presenting one report.

At the symposium, 121 academic reports were exchanged and read, including reports on gas lasers, solid gas lasers, semiconductor lasers, dye lasers, mutual reactions between laser and materials, laser materials, light source, film technology, electronics technology, testing technology and information processing technology.

These reports reflected the progress in scientific research in recent years at the Shanghai Optics and Fine Mechanics Institute. For example, such articles as "the submillimicrosecond neodymium phosphate glass laser systems" provide important data and experience for establishing high power large phosphate glass laser systems in the future. "The improvement of the AlGaAs/GaAs multiple layer liquid phase extension system" and "the masking of the selected expansion of Zn of the plane strip laser" and similar reports are the new technological and technical results of research in the gallium arsenide di-isomeric laser conducted at our institute, enabling the percentage of finished products in the manufacture of lasers to reach above 60 percent and the life of the components to last for over 10,000 hours--valuable results for popularization and production. An article on "higher order coherent anti-Stokes and coherent Stokes-Raman scattering" reported that when the 1086 centimeter^{-1} Raman mode of a calcite sample was parallel to the light axis, the first to fifth order CARS spectra and the first and second order CSRS spectra of the calcite could be simultaneously observed. The "study of high velocity flow of large dimension knife plate discharge" has provided the possibility for developing the use of air to replace helium as the medium to expand the discharge dimension and to increase the output power of the high power CO_2 laser. An article on "chromatic dispersion of inorganic glass" discussed the requirements of complete achromatism of modern optical instruments upon the relative partial chromatic dispersion of glass. The computer and chromatic dispersion data of glass were used to compute the characteristic absorption of ultraviolet light of glass, the vibration frequency of infrared light of glass and the force of the vibrator. Their relationship to the composition and structure of glass was shown. A method of calculating the relative partial chromatic dispersion of glass according to the composition of glass was proposed. An article on the "small neodymium pentaphosphate laser" reported on the good progress realized in the total weight of the laser and the function of the laser. The "nth order isolated wave theory" started out from the vectors of the phase space and obtained the general expression of the nth order isolated wave equation and its general solution, the results already obtained have been improved, and the general expression can be used to study the mutual reaction among multiple waves.

9296
CSO: 4008/419

APPLIED SCIENCES

INSTITUTE REPORTS PROGRESS IN LASER CRYSTAL RESEARCH

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8, No 5, 1981 pp 63-64

[Article by Zhang Ying [1728 5391]: "Progress in Laser Crystal Research by the Huabei Photoelectricity Institute in 1980"]

[Text] Breakthrough in Yttrium Lithium Fluoride Laser Crystal Enables Laser To Operate

The YLF laser crystal, with its superior ultraviolet characteristics and its suitability for mixing in many types of rare earth active ions and sensitized ions, can produce laser jumps of more than 20 wavelengths of 0.3 to 0.9 micrometer. It has attracted attention both at home and abroad. During our long period of research, loss of transparency of the crystals was a problem. In 1980, many technological measures were used in the preparation of the raw material and the conditions of growth of the crystals, and a breakthrough was achieved in the technology related to the loss of transparency of the crystals. We obtained three transparent monocrystals: Nd:YLF, Er:YLF and Ho:YLF.

The Nd:YLF laser rod was installed in a specially designed laser for laser tests, and laser operation was realized. Its properties are:

(1) YLF:Nd 1%, ϕ5x47 millimeters.
Laser threshold of 3.7 joules.
Pump energy of 18 joules, laser output of 53.3 millijoules.
Slope efficiency of 0.56%.

(2) YLF:Nd 1%, ϕ5x29 millimeters.
Laser threshold of 3.9 joules.
Pump energy of 18 joules, laser output of 74.62 millijoules.
Slope efficiency of 0.7%.

The Monocrystal Furnace With Automatic Control of Diameter Using an Electron Scale for Laser Crystals Passed Evaluation at the Ministerial Level

The JDL-40 monocrystal furnace for laser crystals jointly developed by our institute and the Shaanxi Mechanics Academy recently passed joint evaluation by the First Ministry of Machine Building and the Fourth Ministry of Machine Building. Efforts are underway for mass production. This monocrystal furnace is designed specifically according to the demands and the characteristics for the growth of laser crystals and incorporates many new technologies. For example, it uses the system of automatic control of diameter by the electron scale; it achieves automatic control of drawing crystals, widening of the shoulders, equalization of the diameter and ending processes. It uses a controllable silicon contravariator matched with a medium-frequency induction heating system and a torque motor drive for crystal pulling and a rotational speed transmission system. It also has a rotational speed program control, temperature measurement device and an alarm to warn of sudden changes in the growth condition. The entire set of equipment has operated steadily and reliably over a long period. The crystals obtained have an even outer shape (the difference in total diameter of the portion of equal diameter of the crystals is ±1%). It has produced superior quality crystals Nd:$YAlO_3$, Nd:Cr:$YAlO_3$, Nd:YAG, and Nd:Cr:YAG (see Figure 1).

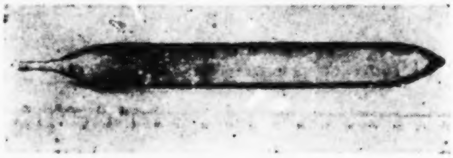


Figure 1. The Nd:YAG crystal grown in the JDL monocrystal furnace.

Evaluation at the ministerial level and by members of the same profession reveals that the JDL-40 monocrystal furnace for laser crystals has reached an advanced domestic level.

Progress Made in the Study of the Function of Cr^{3+} in the Nd:Cr:YAG Crystal

In the past, in the study of the Nd:Cr:YAG crystal abroad, it was believed that while Cr^{3+} has a definite sensitization function, the energy transfer time is long (6.2 milliseconds), and the contribution of sensitization is not large. Also, it was believed that Cr causes definite damage to the optical quality of the crystals. In our research we used the best mixing concentration and technological conditions. We not only proved the sensitization function of Cr^{3+} in the spectrum and laser properties, but we also determined the superiority of the Nd:Cr:YAG crystal in the operation of a continuous laser. Through X-ray diffraction analysis we also proved that because of the different distribution patterns of Nd^{3+}, Cr^{3+} in the crystals, the lattice distortion of the entire YAG crystal rod was improved. In addition, Cr serves to purify harmful impurities in the melt. Using specific amounts of mixture and conditions of growth, we can obtain superior quality crystals without any scattering grains. Thus we refuted the belief held abroad that Cr is harmful to the optical quality of the YAG crystal. Tests of the absorption spectrum and laser tests also show that the anti-ultraviolet irradiation characteristics of the double mixed crystal are better. When irradiated by a 3700 Å pump, the laser rod operates for a long time without producing a chromatic core.

YAG Laser Crystals Produced in Small Amounts

In the studies of the Nd:YAG crystal conducted by our institute over many years, the quality of the crystal gradually improved, the technology of growing crystals stabilized, and we have entered the stage of producing the crystals in small amounts. The laser rods produced are for use by our institute and are also provided in small amounts to domestic users. The properties and quality of the crystals have been praised by the users. Now we are continuing to study the techniques of growing crystals of large dimensions and improving the optical evenness of the crystals.

Standardization of YAG Laser Rod Tests Progresses

As the YAG laser crystal enters into production in small amounts, testing of the properties of the laser rods has gradually progressed toward standardization. Institute level standards are being established for the long pulse laser properties test, continuous laser property tests and the achromatic ratio tests for the YAG laser rod. The energy meter and the power meter are being calibrated according to the standards of the Chinese Measurement Sciences Academy. Conditions for the testing of interference lines are being established. On this basis, we are revising the technical conditions for sample standardization of the YAG laser rods.

Optical Evenness of the Sodium Barium Niobate Crystal Improved

Our institute used the pulling method and stop-and-go rotary growing technique to obtain a BNN nonlinear frequency multiplying crystal of a diameter of 25 millimeters. Observation of the interference lines showed the stop-and-go rotary growing technique can produce crystals with good optical evenness (see Figure 2). Frequency multiplying laser properties tests also preliminarily showed the crystal's superiority.

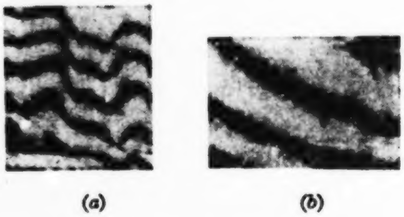


Figure 2. Interference lines (3.5x) of BNN nonlinear crystals. (a) rotating the crystal at 10 revolutions/minute; (b) rotating the crystal at 0 revolutions/minute.

9296
CSO: 4008/419

APPLIED SCIENCES

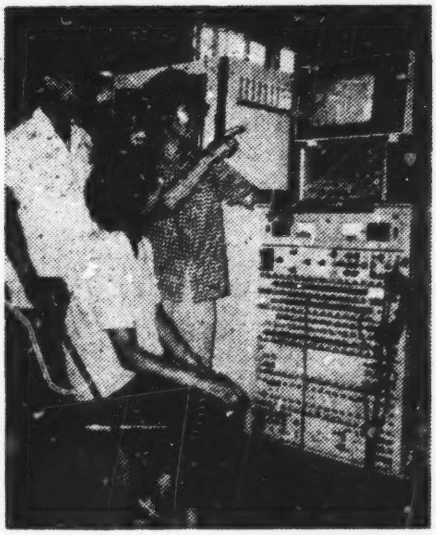
FIRST FIBER OPTICS COMMUNICATIONS LINE INSTALLED IN NANJING

Nanjing XINHUA RIBAO in Chinese 7 Jul 81 p 1

[Article by Xu Qisan [1776 0366 0005]: "Nanjing Uses Our Nation's First Optical Fiber Communications Line"]

[Text] Our nation's first optical fiber communications line, 3.2 kilometers long, has successfully gone into operation in Nanjing. Yesterday, the evaluation conference, through which the scientific commission of the Power Ministry provided assistance, ended and the conference satisfactorily concluded the evaluation of the function of this great scientific and technological achievement.

Fiber optics communication is a new communication technology that has developed only in recent years. Compared to metallic wires, optical fibers have many superiorities: their capacity is large--on an optical fiber thinner than a piece of human hair, several hundred thousand telephone channels can be used simultaneously without crosstalk--security is strong, there is no interference from external magnetic fields, insulation is good, they are convenient to install, and they are not affected by lightning or dampness. Therefore, they are receiving popular attention in our nation and in other nations. In the power industry, as the electrical capacity drastically increases, power is transmitted at ultrahigh voltage, the effects of electromagnetic interference and the rise in the ground electrical potential are becoming increasingly serious day by day, and the system of transmission of information is urgently in need of improvement. To utilize fiber optics communications technology to solve this problem, at the end of 1977 the Nanjing Automation Institute established a special staff group, and with the cooperation of the Nanjing Power Supply Bureau, a relatively short time was required to develop an optical fiber communications system, and a 3.2-kilometer-long system was installed between the Nanjing Power Supply Bureau and the Chaotiangong Transformer Station. Since service was started in January of this year, the system has reliably transmitted telephone dispatches, closed circuit television images and telemechanical signals; the major technical indicators have met all the demands. The dispatcher sits in the dispatching room at the Power Supply Bureau and can see the facilities and the operations in the transformer station at Chaotiangong.



Fiber optics communications has great superiority. The photo shows the technicians of the Nanjing Automation Institute utilizing fiber optics communication to clearly observe the situation in the transformer station at Chaotiangong from the Nanjing Power Supply Bureau.

9296
CSO: 4008/419

DEVELOPMENTS IN COMPUTER TECHNOLOGY REPORTED

Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in English Vol 18 No 15, 5 Aug 81 p 16

[Text] Position, Role of Computers in National Economy

The author Li Rei, vice-minister of the Fourth Ministry of Machine-Building and Director of the State Administration of Electronic Computer Industry reviewed the application of computers in various branches of national economy in different countries, summarized its importance in modern society, and indicated its impact on various industries and defense.

The author also stressed importance of computers in China's four modernizations and the necessity to accelerate development of China's computer industry.

The China-Made Computer-Laser Typesetting Passed Technical Evaluation

The two-year pilot operation of the first China-made prototype computer-laser precision typesetting system proved, that its design principle is correct and that its system reliability had increased.

The evaluation meeting sponsored in July 1981 by the Ministry of Education and the State Administration on Electronic Computer Industry, indicated, that the hardware performance of the machine is superior to that of the fourth generation Chinese-character laser typesetting system exhibited in Beijing by British Monotype Inc. in 1979, and some of its software typesetting functions had also achieved international level.

The machine has successfully passed the evaluation.

How To Make a General Microcomputer To Have Chinese Character Processing Capability

Beijing Computer Research Institute has succeeded in developing a special software, by which its BCM general microcomputer system can be used as a Chinese Character processing system.

This new software consists of the following modules: the operating system for Chinese character processing, the Chinese character library, the code reference table, the Chinese character generator, etc. By virtue of the operating system for Chinese character processing, the newly developed software can be operated without control by the original CP/M to save storage space. Over 5,000 Chinese characters can be formed by the generator.

The use of this system can be expanded easily to other micro-computer systems, which are based on Z-80 CPU, 64K RAM, floppy disk storage and seven-pin or nine-pin printer. Its design principle can also be applicable to minicomputers.

Software Allows On-Machine Program Error Corrections

The Nanjing Astronomical Instrument Factory has modified and complemented the compiler system and monitor system used for TQ-16, so that both source program and data of basic format scan have functions similar to editor functions in grammar-checking phase and translation [word indistinct] respectively. This facilitates both error analysis and on-machine program modification.

As a result, operation efficiency is increased and machine time saved.

The DJS200/XT1 Operating System

The DJS/XT1 operating system, abbreviated as XT_1, is a general-purpose operating system, developed for DJS200 series machines. It has two versions, XT_1G and XT_1P.

XT_1G uses a drum as its backing storage. It was designed in 1978 and passed evaluation in 1980. The functions provided by XT_1P are: organization, control and management of jobs written in different languages, job spooling; file management; internal storage management and terminal management.

XT_1P uses a disk as its backing storage. It inherits the system architecture of XT_1G, but has expanded functions. XT_1G will [be] put into use in 1982.

News Briefs

According to an agreement between Beijing Electronic Instrument Administration and some Japan companies, microcomputer software exchange between them will be organized, and two technical personnel from China will be sent to Japan for promotional purpose and will stay there for 1-2 years.

An exhibition and sale of China-made computer products sponsored by the State Administration of Electronic Computer Industry will be held from September to October. Best products will be provided to the users by various computer manufacturers.

CSO: 4020/242

SCALE MODEL PLANS MAY ANSWER QUESTIONS ON QIANG-5 AIRCRAFT

Beijing HANGKONG ZHISHI [AEROSPACE KNOWLEDGE MAGAZINE] in Chinese No 8, Aug 81 p 32

[For photographs of the actual aircraft these scale model plans are based on please see JPRS 74396 of 17 Oct 79 CHINA REPORT, POLITICAL, SOCIOLOGICAL AND MILITARY AFFAIRS, No 25, pp 71-72]

[Text] This aircraft is the Chinese-made Qiang-5 supersonic attack aircraft.

Key to scale model:

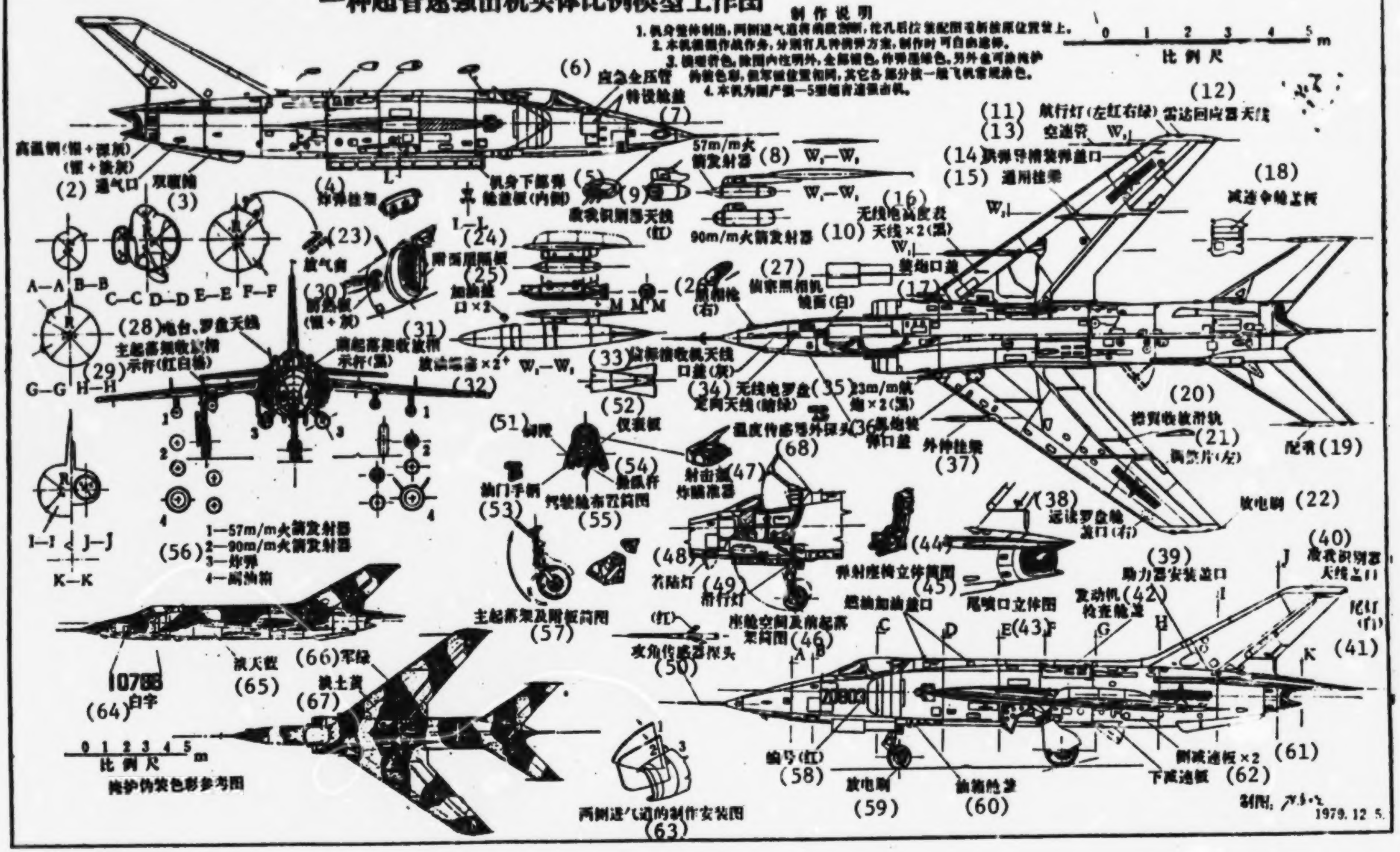
1. High-temperature steel
2. Vent
3. Twin ventral fins
4. Bomb racks
5. Ventral bomb bay doors (inner side)
6. Emergency ram intake
7. Special equipment bay cover
8. 57mm rocket launcher pad
9. IFF antenna
10. 90mm rocket launcher pad
11. Navigation light (red on port, green on starboard)
12. Radar responder antenna
13. Pitot tube
14. Missile charging cover [?]
15. General purpose pylon
16. Radio altitude indicator (2 antennas, black)
17. Cannon loading gate cover
18. Drag chute bay door
19. Balancing weight
20. Flap retraction track
21. Trim tab (port)
22. Electrical discharge brush
23. Bleeder
24. Boundary layer divider
25. Fuel cap (X2)
26. Camera bay (starboard)
27. Reconnaissance camera mirror
28. Radio compass antenna

29. Indicator post (red and white) [barber's pole]
30. Blast shield
31. Forward (nose gear) landing gear retract indicator
32. Bleeder
33. Beacon receiver antenna cover
34. Radio compass fixed antenna (dark green)
35. Two 23mm aircraft cannon
36. Cannon ammunition loading gate cover
37. Extended spar
38. Distant-reading compass compartment cover (starboard)
39. Booster [servo] safety hatch
40. IFF antenna hatch opening
41. Tail light (white)
42. Engine inspection hatch
43. Tail pipe, three-dimensional view
44. Simplified three-dimensional view of ejection seat
45. Fuel loading cap
46. Cockpit space and forward landing gear
47. Sights for firing and bombing
48. Landing light
49. Taxing light
50. Angle of attack sensing element [or detector]
51. Diagram of cockpit layout
52. Instrument panel
53. Throttle
54. Control stick
55. Foot pedal
56.
    - 1--57mm rocket launcher pad
    - 2--90mm rocket launcher pad
    - 3--bombs
    - 4--auxiliary fuel tanks
57. Main landing gear [or main undercarriage]
58. Port number (red)
59. Electrical discharge brush
60. Fuel tank bay cover
61. Two side air brakes
62. Ventral air brake
63. Twin air intakes
64. White
65. Light sky blue
66. Army green
67. Light ochre
68. External temperature sensor

一种超音速强击机实体比例模型工作图

制作说明

1. 机身整体制出，两侧进气道待机身制断，舵孔后位按配图重新按原位置装上。
2. 本机模拟作战任务，分别有几种挂弹方案，制作时可自由选择。
3. 俯视背色，除图内注明外，全部银色，炸弹墨绿色。另外也可涂掩护伪装色彩，但军徽位置相同，其它各部分按一般飞机常规涂色。
4. 本机为国产强—5型超音速强击机。



0 1 2 3 4 5 m
比例尺
(1) 高温钢(银+深灰)(银+淡灰)
(2) 通气口
(3) 双座舱
(4) 炸弹挂架
(5)
(6) 应急全压管
特设舱盖
(7)
57m/m火箭发射器 (8) W₁—W₁
(9) 敌我识别器天线(红)
W₁—W₁
90m/m火箭发射器 (10)
(11) 航行灯(左红右绿)
(12) 雷达回应器天线
(13) 空速管 W₁
(14) 供弹导槽装弹盖口
(15) 通用挂架
(16) 无线电高度表天线×2(黑)
(17) 警炮口盖
(18) 减速伞舱盖板
(19) 配重
(20) 襟翼收放滑轨
(21) 调整片(左)
(22) 放电刷
(23) 放气阀
(24) 附面层隔板
(25) 加油盖口×2
(26) 照相舱(右)
(27) 偵察照相机镜面(白)
(28) 电台、罗盘天线
(29) 主起落架收放指示杆(红白格)
(30) 防热板(银+灰)
(31) 前起落架收放指示杆(黑)
(32) 放油活门×2
(33) 应答信标机天线口盖(灰)
(34) 无线电罗盘定向天线(暗绿)
(35) 23m/m航炮×2(黑)
(36) 航炮装填口盖
温度传感器外探头
(37) 外伸挂架
(38) 远读罗盘舱盖口(右)
(39) 助力器安装盖口
(40) 敌我识别器天线盖口
(41) 尾灯(白)
(42) 发动机检查舱盖
(43)
(44) 弹射座椅立体简图
(45) 尾喷口立体图
(46) 座舱空间及前起落架简图
(47) 射击瞄准器
(48) 着陆灯
(49) 滑行灯
(50) 攻角传感器探头(红)
(51) 驾驶杆
(52)
(53) 油门手柄
(54) 操纵杆
(55) 驾驶舱布置简图
仪表板
(56) 1—57m/m火箭发射器 2—90m/m火箭发射器 3—炸弹 4—副油箱
(57) 主起落架及附板简图
(58) 编号(红)
(59) 放电刷
(60) 油箱舱盖
(61)
(62) 侧减速板×2 下减速板
(63) 两侧进气道的制作安装图
(64) 10788 白字
(65) 淡天蓝
(66) 军绿
(67) 淡土黄
掩护伪装色彩参考图
比例尺
燃油加油盖口
A—A B—B C—C D—D E—E F—F G—G H—H I—I J—J K—K
M M M
20803
制图：
1979. 12. 5.

CSO: 4008/460

POPULATION FORECASTING MODELS, PREDICTIONS DISCUSSED

Shanghai ZIRAN ZAZHI [NATURE JOURNAL] in Chinese No 4, 1981 pp 249-252

[Article by Song Duan Yu [1345 3843 3768], Wuhan Mathematics and Physics Institute, Chinese Academy of Sciences; Shao Kezhen [6730 0668 2182], South Central Academy of Electric Power Design; Jiang Zhongquan [3592 1350 6898], No 1 Metallurgy Company, Ministry of Metallurgy; Wu Weimin [0702 1983 3787], Institute of Rock and Soil Mechanics; Feng Ronghao [1409 2837 6275], South Central Academy of Construction and Design: "Population Forecasting Model and National Population Forecasting"]

[Text] Importance of Population Forecasts

Population is a complex element in society, and it is also a principal part of and a foundation of social activity. The population problem, like other objective matters, possesses its own laws, and has become a science, which increasingly attracts the serious attention of scientists. How to effectively control population has become a problem about which people are more and more concerned in the process of realizing the four modernizations in China. At the present time, the level of China's production is rather low, and there is a vast gap between national average earnings in China and those of advanced countries. If China's national average income is to show fairly great increase by the end of this century, it will be necessary to control the speed of population growth. Population planning requires forecasting the level of population development after the year 2000 on the basis of the present population birth situation in China. Thus, population forecasts can provide precise information for population policies and population planning. Population forecasts differ from meteorological, earthquake, or economic forecasts, and have their own characteristics. The forecast period is not 1 or 2 days, but rather several years or several decades. This article provides a briefing on the model for population forecast calculation methods that we use, and discusses our views about national population forecasting.

Types of Population Forecasts

The traditional concepts of the past on the population development issue must be changed. The longstanding historical idea that "a vast territory with rich resources and a teeming population" is an honor, has been acknowledged to be an arrogance of the Chinese race. Now, we must regard the problem of population development not only as a problem of further population growth, but also regard it as a serious impediment to the four modernizations process that the country faces, which carries with it serious latent political problems. It relates to increases in the standard of living of the present generation, and simultaneously determines what kind of accumulated wealth this generation will leave posterity--hardships or happiness. Thus, population policies must control the present population and institute planned parenthood. Correspondingly, population forecasts should use the mathematical models of controlled population forecasts. If population development is not controlled and people are free to give birth as they please, it will become a free population forecast mathematical model.

We must make population forecast calculations; however, population statistical methods currently are not unified. In using data from population statistics departments, mathematical processing will be required. In the two national population census years of 1953 and 1964, data on population distribution by age and by deaths was generally not available for other years except for individual cities, and so it is recommended that a unified population forecasting mathematical model and commensurate statistical forms be established nationwide.

In our mathematical models, the population birth cycle is a rather major statistical coefficient. The population birth cycle is not derived from legal age, but from the use of statistical methods.

Our mathematical model is calculated on the basis of a closed population system, and for population shifts in each area, consideration must be given to age distributions of those who move, meaning population distribution according to age and distribution of deaths. If this is not done, the accuracy of the forecast will be impaired.

Unless methods are accurate and statistical criteria reasonable, the attainment of fairly high accuracy in figuring population forecasts will be difficult. Song Jian [1345 0256] et al[1] have proposed a series of partial differential equation structural forms on the issue of population control, and have used discretely calculated mathematical models to predict China's population for 100 years, attaining a rather high degree of accuracy, and blazing a trail for the scientific development of China's population system. Here we have adopted the direct calculation method to make population forecasts, and our reasons for emphasizing the direct method are as follows:

1. Population forecasts or other calculations should attain a high degree of accuracy.

2. The layers and bands developed in the historical development of population should be retained. These constitute a special kind of information for population births.

3. The structure of mathematical models should be perceived directly and be easily promoted.

4. Information that satisfies the requirements of other population models (such as working population models, models that show fluctuations in population in enterprises) should be readily separated out of these models.

Statistical Distribution of Three Sets of Population Movements

People's life span and age are calculated in terms of their present age. Population statistics in China today use ages from 0 to 100 as their statistical range, which is called a centenary table. Inasmuch as the number of the population above the age of 100 is fairly small, it is ignored, thus naturally there is some error in this. If a person who lives to maximum age is postulated as age r_m, when the population is counted, it is divided into 0, 1, 2, ..., r_m in an age spread of $r_m + 1$. There are three sets of data in terms of age distribution: First is the number of the population of different ages in any given year, which is termed population distribution according to age, or simply population distribution, which is written as $M_r(t)$, with t standing for the time, and r standing for the range of age, and $r = 0, 1, 2, \ldots, r_m$. Second the number of deaths at different ages in any given year, which is termed distribution of population deaths according to age, or simply distribution of deaths, and written as $M^d_r(t)$, with $r = 0, 1, 2, \ldots, r_m$. Third is the number of women bearing children in any given year, which is termed distribution of childbearing women according to age, or simply distribution of births, and written as $M^o_r(t)$, with $r = n', n' + 1, \ldots, n$. In the distribution of the above three sets of statistics, data about the last set is very difficult to locate in population statistics departments.

In forecast calculations, when T is used as the starting point for any given year, that year is known as the datum year or base year. The sum total of this base year's population distribution $M_r(T)$ is $M_\Sigma(T)$, thus:

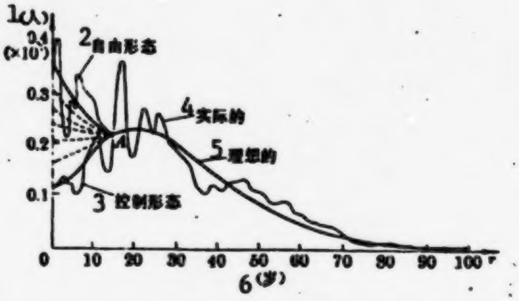
$$M_\Sigma(T) = \sum_{r=0}^{r_m} M_r(T). \qquad (1)$$

We define the proportion of age r males and females $M_r(T)$ in the total population $M_\Sigma(T)$ as the density of population according to age in T year, p (r, T), or density of population distribution, for short,

$$p(r,T) = \frac{M_r(T)}{M_\Sigma(T)} \quad (r = 0, 1, 2, \cdots, r_m). \qquad (2)$$

Because population distribution may be distinguished as having a controlled configuration or a free configuration, the two are described separately in Illustration 1. Illustration 1 has descriptive curves. The bold line is an ideal situation following an ironing out, while the thin line shows actual fluctuations in population distribution, called the population band. The sections of the curve up to point A show the fluctuations between the controlled configuration and the free configuration. The dotted lines show transitional configurations. After point A, the free configuration, the controlled configuration, and the transitional configuration are combined into a single curve to become a complete population distribution curve of numerous bands.

Illustration 1. Depiction of Population Distribution Configuration



Key:

1. (People)
2. Free Configuration
3. Controlled Configuration
4. Actual
5. Ideal
6. (Age)

Distribution of deaths in the population on the basis of age in T year is M^d_r (T). During any given year, the number of deaths of people of different ages varies, the aged being most numerous, children and middle age people being second, and youths being least. The death rate or death density $\sigma(r, T)_2$ characterizes the distribution of deaths:

$$\sigma(r, T)=M^d_r(T)/M_r(T) \quad (r=0, 1, \cdots, r_m), \qquad (3)$$

Its significance is the number of population deaths at age r, M^d_r(T) as a proportion of the population at age r.

Thus is derived

$$\varphi(r, T)=1-\sigma(r,T) \quad (r=0, 1,\cdots, r_m), \qquad (4)$$

which is termed the population survival rate by age range in year T, i.e. the proportion of the surviving population at M_r (T) at the end of year T. These basic concepts are used not only in calculating population forecasts, but are also used in calculating average population longevity.

Distribution of childbearing women by age in T year is M^o_r (T). Presented in the following table is the data we obtained from nearly 10,000 pieces of statistical data on the number of women between the ages of 20 and 43 who gave birth in 1979 among women of childbearing age in a certain prefecture.

Statistics on Number of Childbearing Women in a Certain Prefecture in 1970

Age Range r	Number of Childbearing Women $M^o_r(79)$	Age Range r	Number of Childbearing Women $M^o_r(79)$
20	10	32	318
21	27	33	181
22	59	34	98
23	166	35	78
24	564	36	35
25	1,680	37	29
26	2,690	38	22
27	2,422	39	14
28	1,858	40	4
29	1,402	41	3
30	937	42	2
31	488	43	1

To find the average age, R, of childbearing women,

$$R=\sum_{r=20}^{43} r M^o_r(79) / \sum_{r=20}^{43} M^o_r(79) = 27.43(\text{age}). \quad (5)$$

This table shows the average age, R, of the childbearing women in that prefecture to have been 27. Thus the population birth cycle R + 1 = 28 is derived, and so 30 years is the population median forecast standard.

The corresponding number of women for the average age, R, of childbearing women is $M_R(T)/2$, because $M_R(T)$ is the sum of the male and female population. In order to simplify calculations, the probability for males and females is half for each, thus, it is multiplied by 1/2. $M_R(T)$ is related to the number of people born in T + 1 year, thus the following formula is established:

$$M_o(T+1) = \lambda(T+1)\, M_R(T) \qquad (6)$$

In this formula $\lambda(T+1)$ is total birthrate, or average birth coefficient, i.e. half the individual number of children born in T + 1 year per every man and wife, which is one-half the average number of births. If $\lambda = 0.5$, the average births per man and wife is one.

Setting up Mathematical Models for Controlled Population Forecasts

Once we have derived the three kinds of distribution given above, we can calculate population forecasts. Our method is the discrete direct recurrence method of calculation. Using this, we first figure out a continuous population development activity formula. Using the rotational movement in ages of the population, we know that this year is age r, and next year is age r + 1. If in a certain area, the number of people at age r in year t is $M_r(t)$, a year later the number of people will be $M_{r+1}(t+1)$, the population delay relationship existing between being:

$$M_{r+1}(t+1) = M_r(t) - M^d_r(t) \qquad (7)$$

By substituting formula (3) in the above, from $\Delta r + \Delta t = 1$ and the total differential definition is derived

$$\frac{\partial M_r(t)}{\partial r} + \frac{\partial M_r(t)}{\partial t} = -\sigma(r, t)M_r(t), \quad (8)$$

This is a continuous population development activity formula.

If T is the base year, construct

$$M_r(t)|_{t=T} = M_r(T) \quad (r = 0, 1, \cdots, r_m), \quad (9)$$

This is called formula (8)'s initial condition, while

$$M_r(t)|_{r=0} = M_0(t);\ M_r(t)|_{r=r_m+1} = M_{r_m+1}(t) = 0, \quad (10)$$

is called formula (8)'s border condition.

Thus, formula (8) can be solved under the initial boundary conditions of (9) and (10), and the solution is unique. Formula (8) is considered under the circumstances of a closed system. If there are migrations, the population distribution of the migrants has to be added to the right side of formula (8).

The steps in our recurrent calculations are explained below. We first sought the population distribution and its sum for T + 1 year. We used three statistical distributions, making the population distribution in base year T the initial condition M_r(T) ($r = 0,1,\ldots,r_m$), M_o (T + 1), i.e. formula (6), and deriving M_r (T) from the birth distribution, ^{o}(T + 1) being the control coefficient in the setup. Then formulas (3) and (4) were substituted in (7) to derive

$$M_{r+1}(T+1) = M_r(T)\varphi(r, T). \quad (11)$$

Use of formulas (2), (6), and (11) derived population distribution in T+1 year as follows:

$$\begin{cases} M_0(T+1) = \lambda(T+1)M_\Sigma(T) \\ \qquad = M_\Sigma(T)\lambda(T+1)p(R, T), \\ M_r(T+1) = M_{r-1}(T)\varphi(r-1, T) \\ \qquad = M_\Sigma(T)p(r-1, T)\varphi(r-1, T) \\ \qquad (r = 1, 2, \cdots, r_m), \end{cases} \quad (12)$$

In this formula, M_o (T + 1) represents the children born in T + 1 year, with no consideration given to the infant mortality rate, because when counting the number of infants, infant deaths for the year were not treated as birth in the population.

From formula (2) was correspondingly derived the total population in T + 1 year

$$\begin{aligned} M_\Sigma(T+1) &= \sum_{r=0}^{r_m} M_r(T+1) \\ &= M_\Sigma(T)[\lambda(T+1)p(R,T) \\ &\quad + \sum_{r=0}^{r_m-1} p(r, T)\varphi(r, T)]. \end{aligned} \quad (13)$$

Continuing to find out the population distribution and its sum in T + K year. This is figured by using year by year changes in death rate. As a result of social progress, the mortality rate is fairly stable, and can be rendered approximately as:

$$\varphi(r,t) \doteq \varphi(r,T) \quad (t=T+1,\ T+2,\cdots,\ T+k). \tag{14}$$

Through continued application of formulas (6), (11), and (14), population distribution in T + K year was derived as follows:

$$\begin{cases} M_0(T+K) \\ \quad = M_\Sigma(T)\lambda(T+K)p(R-K \\ \quad +1,T)\varphi(R-K+1,\ T) \\ \quad \cdots\varphi(R-1,\ T), \\ M_1(T+K) \\ \quad = M_\Sigma(T)\lambda(T+K-1)p(R-K \\ \quad +2,T)\varphi(R-K+2,T) \\ \quad \cdots\varphi(R-1,T)\varphi(0,T), \\ \quad \vdots \\ M_{K-2}(T+K) \\ \quad = M_\Sigma(T)\lambda(T+2)p(R-1,\ T)\varphi(R \\ \quad -1,\ T)\varphi(0,\ T) \\ \quad \cdots\varphi(K-3,T), \\ M_{K-1}(T+K) = M_\Sigma(T)\lambda(T+1)p(R,\ T)\varphi(0,T) \\ \quad \cdots\varphi(K-2,\ T), \\ M_K(T+K) = M_\Sigma(T)p(0,T)\varphi(0,T)\varphi(1,T) \\ \quad \cdots\varphi(K-1,\ T), \\ \quad \vdots \\ M_{r_m}(T+K) = M_\Sigma(T)p(r_m-K,\ T)\varphi(r_m-K,\ T) \\ \quad \cdots\varphi(r_m-1,\ T) \quad (K=1,2,\cdots,k). \end{cases} \tag{15}$$

Thus, the population total correspondingly derived from (15) for T + K year is:

$$\begin{aligned} M_\Sigma(T+K) &= \sum_{r=0}^{r_m} M_r(T+K) = M_\Sigma(T)\Big[\sum_{j=1}^{K}\lambda(T \\ &+j)p(R-j+1,T)\prod_{s=0}^{j-2}\varphi(R-s-1,\ T)\prod_{i=0}^{K-j-1}\varphi(i,T) \\ &+\sum_{r=0}^{r_m-K}p(r,\ T)\prod_{s=0}^{K-1}\varphi(r+s,\ T)\Big] \\ &(K=1,\ 2,\cdots,k). \end{aligned} \tag{16}$$

By using formula (16) to make calculations, we can forecast any year's population total. Since the $\lambda(t)$ choices differ, various different control programs are derived. For example if for each man and wife there is only a single birth, $\lambda = 0.5$; if two births, $\lambda = 1$.

Setting Up Mathematical Models for Free Population Forecasts

Formula (16) is the calculation method we recommend. In instituting population control in China's present planned births, it is through choice of λ the number of births in the population is regulated. However, some countries with a sparse population encourage births, and when this is done, it is necessary to use a mathematical model for free population forecasts. Instead of trying to determine the corresponding distribution of average reproductive age R, it is necessary to count the number of people born at each age during women's reproductive years, M^0_r (T) (and to further divide the number according to double, triple...), and from these calculations to derive the reproduction probability of women of r age in T year.

$$\mu(r,T)=M^0{}_r(T)/M_r(T) \quad (r=n',n'+1,\cdots,n), \tag{17}$$

其中 n' 为最小生育年龄，n 为最大生育年龄.

从公式(17)得出第 $T+1$ 年的出生人口为

$$\begin{aligned} M_0(T+1) &= \sum_{r=n'}^{n} \mu(r,T)M_r(T) \\ &= M_z(T)\sum_{r=n'}^{n} \mu(r,T)p(r,T), \end{aligned} \tag{18}$$

Other distribution of population and control models being the same, the total population derived for T + 1 year is:

$$\begin{aligned} M_z(T+1) = M_z(T)\Big[&\sum_{r=n'}^{n} \mu(r,T)p(r,T) \\ &+ \sum_{r=0}^{r_m-1} p(r,T)\varphi(r,T)\Big]. \end{aligned} \tag{19}$$

以此类推，第 $T+\bar{m}+1$ 年的人口总和为

$$\begin{aligned} M_z(T+\bar{m}+1) = M_z(T)\Big\{ &\sum_{r=n'}^{n} \mu(r,T)\Big[\sum_{j=1}^{\bar{m}+1} p(r-i \\ &+1,T)\prod_{e=0}^{j-1}\varphi(r-e-1,T)\prod_{i=0}^{\bar{m}-j}\varphi(i,T)\Big] \\ &+ \sum_{r=0}^{r_m-\bar{m}} p(r,T)\prod_{e=0}^{\bar{m}}\varphi(r+e,T)\Big\} \quad (\bar{m}=1,2,\cdots,m). \end{aligned} \tag{20}$$

National Population Forecast For 100 Years

Inasmuch as the number of immigrants to China may be ignored,[2] the population of the entire country may be regarded as being a closed system, and the population is being controlled; therefore we used formula (16) to draw up a Fortran language program, using a computer to forecast China's population for a hundred years. The annual total population and related criteria were calculated. For calculation porposes, total death rate was 6.1 percent; average reproductive age was 27; and reproduction control coefficients were worked out for three situations with λ= 0.5, 0.75, and 1.0, i.e. each man and woman averaging the birth of 1, 1.5, and 2 children (λ = 0.5 declining in 10 years from λ = 1, while λ + 0.75 declining gradually over 5 years from λ = 1). Population distribution for the base year was calculated from preliminary data investigated by Comrade Song Jian et al. Ages run from 0 to 114 years old.

Results of calculations show that when λ = 0.5, i.e. a man and woman producing a single child, population will rise from 970-92 million in 1979 to 1,089,730,000 maximum in the year 2000, gradual decline occurring thereafter until the year 2079 when population will decrease to 298.55 million or less than 300 million.

When λ = 0.75, i.e. when each couple produce 1.5 children, population will rise from 970.92 million in 1979 to 1,156,620,000 in the year 2000, reaching a maximum of 1,179,800,000 in the year 2012, thereafter gradually declining to 670.27 million in the year 2079.

If λ= 1, i.e. each couple have two births, the population will be 1,243,070,000 in the year 2000, and reach its zenith at 1,407,540,000 in 2032, thereafter declining until it totals 1,312,260,000 in 2079.

Currently, we currently advocate birth of a single child per couple, in order to bring the population growth rate under control with all possible speed, so that the total national population will be no more than 1.2 billion by the end of this century.

A look at the population of the year 2000 on the basis of the data acquired above shows that if each couple having only a single child can be accomplished, the population in the year 2000 will not exceed 1.09 billion. However, in advocating universal birth of a single child per couple, it is impossible to guarantee that all couples will have only a single chid. Therefore, it is a certainty that by the year 2000, population will exceed 1.09 billion. If each couple gives birth to two children, the population in 2000 will not exceed 1.25 billion, but it will exceed the decided upon objective of 1.2 billion. If half the couples in the country produce one child, and half the couples produce two children, that will mean an average of 1.5 children per couple (of course, in practice it is impossible to tive birth to one and one-half children). Using these calculations, the 2000 population will be 1.156 billion, not exceeding the 1.2 billion figure. Thus, the aforestated objectives are attainable. Inasmuch as minority people areas may continue to have more than two births per couple, the actual year 2000 figure may be a little higher than 1.156 billion. In short, people will have to make an effort to achieve the objective.

The foregoing calculations show that if population is to be controlled at above 1.1 billion and below 1.2 billion within the next 50 years, during this period of time every couple will have to have one and only one child. If each couple is permitted to have only a single child during the next 100 years, the population of China will drop to 300 million. Consequently, it will not be necessary to wait 100 years. By the year 2054, population will drop to the 548 million level of the end of 1949, and other population programs can be formulated. It is not too late to readjust the population reproduction situation; there is no need to worry.

The foregoing gives a general introduction to population forecasting methods and national population forecasting, as well as to other population criteria. Space limitations prohibit giving further detail here.

FOOTNOTES

1. Song Jian and Li Guangyuan [2621 1684 0955], ZIRAN ZAZHI, 2 (1979) 570

2. Cha Ruichuan [2686 3843 0278], RENKOU YANJIU [POPULATION RESEARCH], 2 (1980) 23

3. Li Guoping [2621 0948 1627], Song Ruiyu, Fan Wentao [5400 2429 3447]. SHUXUE MOXING YU GONGYE ZIDONG KONGZHI [MATHEMATICAL MODELS AND INDUSTRIAL AUTOMATED CONTROLS], Vol 1, Hubei Renmin Chubanshe (1979)

9432
CSO: 4005/714

PUBLICATIONS

TABLE OF CONTENTS OF 'TIANWEN XUEBAO' VOL 22 NO 2, 1981

Beijing TIANWEN XUEBAO [ACTA ASTRONOMICA SINICA] in Chinese Vol 22 No 2, Jun 81 inside back cover

[Text] The Star List of Huang You--A Chinese Star List in the Early Middle Ages......Pan Nai [3382 7845], Shanghai Construction Technology Research Institute; Wang Dechang [3769 1795 2490], Purple Mountain Observatory, Chinese Academy of Sciences (119)

On the Essentiality of the Whittaker-Vondrak Method as a Filter, and Estimations of Standard Deviation and Correlation for Digital Filters......Huang Kunyi [7806 0981 0308] and Zhou Xiong [0719 7160], both of the Purple Mountain Observatory, Chinese Academy of Sciences (128)

Will the Equal Altitude Method Make New Contributions to Modern Astrometry?......Li Dongming [2621 2639 2494], Purple Mountain Observatory, Chinese Academy of Sciences (137)

On the Third Order Artificial Satellite Theory......Tong Fu [4547 0102] and Wu Lianda [0702 6647 1129], both of the Purple Mountain Observatory, Chinese Academy of Sciences (144)

The Combined Perturbation of the Orbit of a Closed Earth's Satellite......Liu Lin [0491 2651] and Zhao Dezi [6392 1795 3320], both of the Department of Astronomy, Nanjing University (158)

The Dependence of Kolmogorov Entropy of Mappings on the System of Coordinates......Sun Yisui [1327 5030 3606] and C. Froeschlé, both of the Nice Observatory, France (168)

Lightcurves of Variable Asteroids (IV)......Zhang Yuzhe [1728 6877 0772], Zhou Xinghai [0719 5281 3189] and Yang Xiuyi [2799 0208 5030], et al., all of the Purple Mountain Observatory, Chinese Academy of Sciences (173)

Observations of the Magnitude and Color Variation Object--"bN?" Object in Perseus......Yao Baoan [1202 0202 1344], Purple Mountain Observatory, Chinese Academy of Sciences; Yin Jisheng [1438 3444 3932] and Sun Yili [1327 4135 4409], both of the Beijing Observatory, Chinese Academy of Sciences (179)

Discussion of the Maximum Likelihood Method for Determination of Membership in Open Clusters......Zhao Junliang [6392 0689 0081], Tian Kaiping [3944 0418 1627], Xu Zonghai [1776 1350 3189] and Yin Mingguan [3009 2494 1351], all of the Shanghai Observatory, Chinese Academy of Sciences (187)

Some Characteristics of the Space Distribution of the Solar Proton Active Region......Tang Baisheng [3282 2672 4141], Beijing Observatory, Chinese Academy of Sciences (190)

Radio Radiation Characteristics of Pulsars and Magnetic Dipole Angle......Wang Zhenru [3076 3791 1172] and Chu Yi [0443 0001], both of the Astrophysics Research Division, Nanjing University (194)

Site Testing in Binchuan (I)--Observations......Huang Yinliang [7806 1377 0081] Liu Qingyao [0491 3237 5069] and Wu Xiufang [0702 4423 5364], et al., all of the Stellar Division, Yunnan Observatory (206)

The Formation and Structure of the Neutrino Astronomical Objects......Lu Tan [7120 3499/3508], Nanjing University; Luo Liaofu [5012 6697 1788], Nei Monggol University; Yang Guochen [2799 0948 3819], Hebei Institute of Technology (212)

9717
CSO: 4008/436

TABLE OF CONTENTS OF 'JICHE DIANCHUANDONG' NO 2, 1981

Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 2, 10 Apr 81 p 1

[Text] How to Modernize "Railway Tractive Power"...... Cao Yalin [2580 0068 2651] and Jin Chenhu [6855 6591 5706], both of the Scientific Research Academy, Ministry of Railways (2)

Calculations of the Short Current for Rectifiers of Electric Locomotives......Fan Yuanwu (7)

A Thyristor Converter Used for the Auxiliary System of AC Electric Vehicles......Chen Hanqin and Wan Guang (31)

A New Class-H Enamel for Electrical Products......Cai Binfen [5591 1755 5358], Zhuzhou Electric Locomotive Research Institute (36)

Three-phase Squirrel-cage Motor with Frequency Control System (continued)......Zang Yingjie (59)

General Conditions of the Wheel Axle Crack for 6G Electric Locomotive......Wang Jianzhi [3769 1696 1807], Xi'an Railway Bureau (46)

Operating Conditions for DK-1 Electric Control of Air Brake ......Yuan Antai (51)

9717
CSO: 4008/435

PUBLICATIONS

TABLE OF CONTENTS OF 'HE JISHU' NO 3, 1981

Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 3, Jun 81 preceding p 1

[Text] Radiation Treatment of Environmental Wastes...... Ma Ruide [7456 3843], et al. (1)

A Servo-compensation Method for Radioisotopic Instrumentation......Wu Junheng [0702 0193 1854] and Zhang Daming [1728 6671 2494], both of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences (8)

Applications of Radioisotope X-ray Fluorescence Technique to Geological Exploration......Zhang Ye [4545 8518], Nuclear Geophysic Research Laboratory, Chengdu College of Geology (13)

On-line Measuring of Silver Content in Photographic Film Emulsion by means of Radioisotope Excited X-ray Fluorescence ......Huang Meifen [7806 2734 5358], Wu Wanchun [0702 8001 2504] and Zhao Changyu [6392 2490 5940], all of the Shanghai Materials Research Institute (19)

Preparation of Antigen and Antibody of Cyclic 3', 5'-Guanosine Monophosphate and a Modified Method of Radioimmunoassay ......Dai Tengchang [2071 7506 2490], Hu Yaer [5170 7161 0348] and Xia Zongqin [1115 1350 0530], all of the Shanghai Second Medical College; Ding Xiujuan [0002 4423 1227] and Ju Jiuhong [7168 0036 4767], both of the Shanghai Institute of Traditional Chinese Medicine (27)

A Simple Method for Monitoring Total Tritium in Air...... Xu Zhicheng [1776 1807 2052] and Zhu Jialong [2612 1367 7893], both of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences (35)

The Effect of Low Dose Ionizing Radiation on Increasing Production of Wild Silkworm Eggs......Zhao Guang [6392 0342], Isotope Research Institute, Henan Academy of Sciences; Zhang Jingxuan [1728 2417 6513], Hunan Sericulture Testing Station; Liu Zhenshan [0491 2182 1472], Nanzhao Forestry and Sericulture Bureau (41)

The Fabrication of a Single-ended Coaxial Ge(Li) Detector ......Zhang Zhaozong [1728 2600 1350] and Wu Xumo [0702 4872 2875], both of the Ge(Li) Detector Group, Institute of Nuclear Energy Technology, Qinghua University (46)

Preparation of a Ring-shaped Tritium Target......Wu Jiezheng [0702 6043 1767], Yan Cifu [0917 6337 4395] and Jiang Liguang [5592 4539 0342], all of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences (49)

Brief Description of Performance of a Domestic-made Radiochromatography Scanner......Cheng Huijuan [2052 1979 1227], Ying Houjie [2019 0683 2638], Jing Lie [2529 3525] and Li Wenying [2621 2429 5391], all of the Atomic Energy Research Institute, Chinese Academy of Sciences (51)

A Practical Radiochromatogram Scanning Equipment for Tritium Labeled Compounds......Deng Hongzhang [6772 7703 4545], Hebei Radiomedicine Research Institute; Xie Binghua [6200 3521 5478], Shanghai Nuclear Research Institute, Chinese Academy of Sciences (55)

9717
CSO: 4008/427

PUBLICATIONS

TABLE OF CONTENTS OF 'SHENGWUHUAXUE YU SHENGWUWULI JINZHAN' NO 3, 1981

Beijing SHENGWUHUAXUE YU SHENGWUWULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 3, Jun 81 on back cover

[Text] The Structure and Function of Acetylcholinesterase ......Sun Manji [1327 2581 7221] and Zhou Tingchong [0719 1694 0394], both of the Basic Medicine Research Institute, Academy of Military Medical Sciences (1)

Progress in Lectin Research......Sun Ce [1327 0374], Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (15)

Protein Crystallography--A Powerful Tool in Molecular Biology (I)......Wang Jiahuai [3769 1367 2849], Biophysics Research Institute, Chinese Academy of Sciences (25)

NMR and Its Application in Molecular Biology......Hua Qingxin [5478 1987 2450], Biophysics Research Institute, Chinese Academy of Sciences (30)

Hybrid-arrested Translation and Hybridization Selection...... Wang Shenwu [3769 3947 0063] and Wu Guanyun [0702 0385 5366], both of the Basic Medicine Research Institute, Chinese Academy of Medical Sciences (37)

Regulation of Cyclic AMP in Cell Metabolism......Yi Jianhua [2496 0256 5478], Department of Biology, Wuhan University (40)

Iron in Biomolecules......Liu Ciquan [0491 2945 0356], Shi Xiufan [4258 4423 0416] and Wang Ying [3769 3853], all of the Kunming Institute of Zoology, Chinese Academy of Sciences (45)

A New Method for the Synthesis of the Colored Edam Reagent (DANABITC)......Yu Henian [0205 7729 1628] and Cai Ju'e [5591 5468 1230], both of the Shanghai Biochemistry Research Institute, Chinese Academy of Sciences (51) pH-Colorimetric Method for the Measurement of Creatine Kinase Activity......Yao Qizhi [1202 0796 2535] and Zou Chenglu [6760 2110 7627], both of the Biophysics Research Institute, Chinese Academy of Sciences (52)

The Effect of γ-radiation on Physico-chemical Properties of DNA......Ma Yuqin [7456 3768 3830], Shi Honglin [0670 3163 2651] and Yu Mingzhu [0060 2494 3796], et al., all of the Biophysics Research Institute, Chinese Academy of Sciences (56)

Relation between McCollough After-effect and Pattern Orientation in the Human Visual System......Qi Xianglin [7871 5046 2651], Zhao Guanmei [6392 0385 5019] and Wang Yunjiu [3076 0061 0046], all of the Biophysics Research Institute, Chinese Academy of Sciences (57)

The Capacity of Tolerance of Noise Binocular Steroscopsis ......Zhang Chengxiu [1728 2052 4423] and Zheng Zhuying [6774 4555 5391], both of the Biophysics Research Institute, Chinese Academy of Sciences (61)

Mathematical Model of Ligard-binding Systems Computer-aided for Parameter Fitting......Zhang Yaoyuan [1728 5069 6678], Cai Yonghe [5591 3057 0735] and Zhang Nianyi [1728 1819 0122], all of the Shanghai Cytobiology Research Institute, Chinese Academy of Sciences (64)

Experiments Using Qinghai Potato Starch as a Gel Electrophoresis Medium......Zhou Yucan [0719 5713 3605], Jing Zengchun [2529 1073 2504] and Liu Guofu [0491 0948 1381], all of the Northwest Plateau Biology Research Institute, Chinese Academy of Sciences (66)

An Improved Cell-free System for Protein Synthesis *in vitro* ......Cheng Longsheng [4453 7893 3932], Hu Renqiu [5170 4771 4428] and Wang Jinlan [3769 6930 5695], all of the Biophysics Research Institute, Chinese Academy of Sciences (68)

Isolation and Identification of Nucleic Acid from the Corpse Liver of Changsha Han Tomb......Wang Guihai [3769 6311 3189] and Lu Chuanzong [7120 0278 1350], both of the Biophysics Research Institute, Chinese Academy of Sciences (70)

Separation and Characterization of the Strands of λ plac 5 DNA......Li Jinzhao [2621 6855 3564], Zhu Yigui [2612 0110 2710] and Cui Daoshan [1508 6670 3790], all of the Biophysics Research Institute, Chinese Academy of Sciences (73)

The Application of Emulsifier OP-115 in Liquid Scintillation Counting......Wu Jinshui [0702 6855 3055], Sun Yaochen [1327 5069 3819] and Wang Yibao [3769 6695 1405], all of the Agricultural and Physics Research Laboratory, Crops Institute, Shanghai Academy of Agricultural Sciences (75)

Lactoperoxidase Cellulose......Xu Fen [1776 2001], Ding Guoying [0002 0948 5391] and Hu Yifang [5170 5669 5364], all of the Nanjing Medical College (78)

Cathodic Stripped Voltammetric Determination of Disulfide Bonds for Coat Protein from Shanghai Isolated Holmes Riograss Virus (HRV_{sh})......Song Hongzi [1345 7703 6961] and Wang Naixing [3076 0035 5281], both of the Department of Chemistry, Fudan University (81)

9717
CSO: 4008/428

PUBLICATIONS

TABLE OF CONTENTS OF 'JISUANJI XUEBAO' VOL 4 NO 4, 1981

Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 4 No 4, 1981 inside back cover

[Text] Realization of Theorem Proving on a Minicomputer ......Zeng Xianchang [2582 2009 2490] and Li Weihua [2621 5898 5478], both of Wuhan University (249)

NC Programming and Artificial Intelligence......Qian Wenhan [6929 2429 3466], Jiaotong University, Xi'an (259)

Fuzzy Set Model and Computerized Diagnosis System in Traditional Chinese Medicine......Guo Rongjiang [6753 2837 3068], Institute of Automation, Chinese Academy of Sciences; Ma Binrong [7456 2430 2837], Beijing Second Medical College; Xie Min [6200 2404] and Chen Wuling [7115 0063 7190], both of the Beijing Hospital of Traditional Chinese Medicine (266)

Self-checking of Multi-output Combinational Circuits...... Chen Tongzhao [7115 6639 3564] and Liu Shimin [0491 4258 3046], both of Shaanxi Microelectronics Institute (272)

A Target-oriented Line Search Method for Automatic Circuit Layout in Minicomputers......Yang Ruiyuan [2799 3843 0337], Institute of Computing Technology, Chinese Academy of Sciences (282)

Computer-aided Design of a Sense Amplifier Circuit...... Yang Qiaolin [2799 0829 2651], Institute of Computing Technology, Chinese Academy of Sciences (290)

A Combinational Algorithm Suitable for Computer Aided Circuit Design......Yang Shaoqi [2799 4801 4388], Institute of Computing Technology, Chinese Academy of Sciences (299)

Automatic Routing for the Wiring of Multilayer Printed-circuit Backplanes......Gu Yuan [7357 0337] and Deng Ruohong [6772 5387 7703], both of the Institute of Computing Technology, Chinese Academy of Sciences (308)

A Chinese Character Stroke-encoding System......Li Jinkai [2621 6855 6963], Beijing Normal University (315)

Research Notes

A New Type of Power Supply with a Current-driven Converter ......Zhang Guangming [1728 1639 2494], Institute of Computing Technology, Chinese Academy of Sciences (319)

9717
CSO: 4008/420

PUBLICATIONS

TABLE OF CONTENTS OF 'HUAXUE TONGBAO' NO 6, 1981

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 6, Jun 81 on back cover

[Text] Organic Reactions Using Supported Reagents...... Su Jingyu [5685 6975 1225], Department of Chemistry, Zhongshan University (1)

Photoelectron Spectroscopy of Inorganic Compounds...... You Xiaozeng [3266 2400 2582], Coordination Chemistry Research Institute, Nanjing University; Zhou Zhihua [0719 1807 5478], Department of Chemistry, Nanjing Teachers' College (8)

Mossbauer Study of the Ammonia Synthesis Catalyst--Ferrocene-Active Carbon-Potassium......Zhang Peiqun [4545 0160 5028], Ji Guiquan [6060 2710 3123], Li Shi [2621 1102] and Wu Weifang [0702 5898 5364], all of the Institute of High Energy Physics, Chinese Academy of Sciences; Shen Jianxia [3088 0494 7209] and Wang Zongce [3769 1350 4595], both of the Institute of Botany, Chinese Academy of Sciences (16)

Studies on Synthetic Methods of Ester Derivatives Containing Tetramethylpiperidine-oxyls......Zhu Lizhi [2612 0500 4249], Su Binglu [5685 3521 6922] and Shen Dekang [3088 1795 1660], all of the Institute of Chemistry, Chinese Academy of Sciences (17)

A Survey of the Use of Paramagnetic Reagents in Multinuclear NMR Spectroscopy......M. L. Martin (19)

Dynamic NMR of Less Common Nuclei ^{13}C and ^{15}N......G. J. Martin (20)

The Measurement of Surface and Interfacial Tension of Liquids --An Introduction to the Drop-volume Method......Zhu Buyao [2612 3769/2975 3852] and Zhao Guoxi [6392 0948 3886], both of the Department of Chemistry, Beijing University (21)

The pH of the Precipitation of Sparingly Soluble Compounds in the Presence of a Masking Agent......Deng Tongzhou (27)

The Determination of Purity by Differential Scanning Calorimeter......An Xuwu [1344 4872 2976] and Yan Haike [7051 3189 4430], both of the Institute of Chemistry, Chinese Academy of Sciences (31)

Computer-aided Search and Interpretation of Infrared Spectra ......Nie Chongshi [5119 1504 1395], Wang Yuan [3769 3292] and Zheng Chongzhi [6774 1504 4160], all of the Institute of Organic Chemistry, Chinese Academy of Sciences (38)

Polymer Catalysts for Hydrolysis......Zhang Keda [1728 0668 6671], Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (44)

Surface Active Agents and Their Uses in Industrial Explosives ......Liu Fanrong [0491 0416 2837], Plant No 11, Fushun Mining Bureau (50)

Hybridization and Properties of Organic Compounds...... Yin Bencong [1438 2609 5115], Organic Chemistry Teaching and Research Group, Beijing Chemical Engineering College (52)

On Historical Records of the Invention of Gunpowder...... Guo Zhengyi (59)

Calculation of the H_2O Molecules Liberated from the Metabolic Process of One Molecule of Glucose......Zheng Ji [6774 7162] and Yuan Yusun [5913 3768 5549], both of the Biochemistry Teaching and Research Group, Department of Biology, Nanjing University (60)

9717
CSO: 4008/430

PUBLICATIONS

TABLE OF CONTENTS OF 'JIANZHU XUEBAO' NO 6, 1981

Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 6, 1981 p 80

[Text] Principles and Methods of SAR......Zhang Shouyi (1)

I.M. Pei Talks on Chinese Architecture...... (11)

The Design of the Xiangshan Hotel......Wang Tianxi (13)

Design Methods

Optimum Design of Residential Buildings......Zhan Kesheng (19)

Analysis of Circulation Design in Highrise Apartments...... Mo Tianwei (24)

Computer-aided Design and Sound Quality......Wang Guoquan, et al. (29)

Appraising Solar Radiation on Buildings......Jin Liming (32)

Energy Saving and Architectural Acoustics

Building Shape and Energy Saving......Hu Lin (37)

Solar Heating Houses in Yangcun, Tianjin......Solar Heating Research Group, Tianjin University (42)

Solar House in Quanji, Qinghai......Zhang Weishan (44)

Reverberation Time of Multi-use Auditoriums......Han Lin, et al. (46)

Acoustic Shield for Stage of Multi-use Auditorium...... Xiang Duanqi (50)

Acoustic Design in Theater Competition Projects......Cao Xiaozhen [2580 1321 2182] and Liang Yingtian [2733 2019 3240], both of the Chinese Academy of Architectural Sciences (53)

Apartment Design

Standardization and Diversification of Typical Panel Apartments......Zhao Guanqian [6392 0385 6197], Ban Zhuo [3803 8743] and Ma Yunyu [7456 7301 3768], all of the Fourth Institute of Typical Design, China Building Research Academy (57)

Suggestions for Apartment Design......Cai Jinshui (64)

Consideration of Appearance in Reinforcing Buildings...... Tao Yizhong (65)

On Honeycomb-shaped Apartments......Jiang Zhiyun (66)

On the Article "New Systems of Apartments"......Lin Xien (68)

Traditional Architecture

Space Arrangements in Traditional Buildings in Sichuan...... Wang Guoyu (70)

9717
CSO: 4008/423

AUTHOR: CUI Jiya [1508 3444 0068]

ORG: Beijing Institute of Aeronautics and Astronautics

TITLE: "Approximate Analytical Solution for the Optimum Cycle Parameters of Turbofan Engines with Equal Total Pressure Mixing Exhaust"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 2, May 81 pp 106-110

TEXT OF ENGLISH ABSTRACT: This paper sets forth an approximate analytical solution for the optimum cycle parameters of turbofan engines with equal total pressure mixing exhaust. With a given bypass ratio, three respective optimum compressor pressure ratios for thrust, s.f.c. and fan pressure ratio may be determined, the last one for both thrust and s.f.c. optimum when reheated.

AUTHOR: JIANG Feng [1203 3536]

ORG: Shenyang Aeroengine Company

TITLE: "A Surge Test of a Twin-shaft Turbojet Engine on Ground Test Bed"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 2, May 81 pp 130-136

TEXT OF ENGLISH ABSTRACT: An instrumentation technique for determining the surge point of a twin-shaft turbojet engine on a ground test bed is presented in this paper. The effectiveness of two surge-inducing methods used in the test is also described in the paper. A practical fuel flow step unit is introduced and the surge point measurement and trace analysis of the engine operating point are discussed.

Typical oscillograms are given which were taken when the engine was surging or not surging during the fuel flow stepping. When the engine was brought to surging, the engine operating point trace diagram was determined by a calculation method based on the flow continuity through nozzle guide vanes of the turbine. This diagram is the final result of the surge point determination technique.

AUTHOR: ZHAO Shichun [6392 0013 2504]

ORG: Shenyang Aeroengine Research Institute

TITLE: "Effect of Blade Stagger Angle on Performance of a Transonic Compressor with Low Hub-Tip Ratio"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 2, May 81 pp 137-144

TEXT OF ENGLISH ABSTRACT: The effect of the blade stagger angle on the performance of a transonic compressor with low hub-tip ratio is presented in the paper. Because the original single stage compressor failed to achieve the design target, tests were conducted on the compressor with blade twisted and with the stagger angle reduced. The results of these tests indicate that at the design speed and mass flow, the pressure ratio is 1.339 and the efficiency is 0.864, which is 2.2 percent better than the design value and 5 percent better than that of the original single stage. At the same time, the discharge total pressure and temperature profiles are improved substantially, the unevenness of the total pressure profile decreases from 18 to 7 percent and that of the total temperature from 53 to 18 percent, and the operating point of the compressor has been moved from the left to the right of the characteristic line and is located in a high efficiency region.

AUTHOR: SHI Shuangkai [4258 7175 0418]
ZHANG Zhencan [1728 2182 3605]
ZHANG Yongji [1728 3057 4480]
LI Jusheng [2621 5112 3932]

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "Experimental Study of Heat Transfer to Liquid Metal Sodium Flowing in Circular Tube and Annuli"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese Vol 2 No 2, May 81 pp 173-180

TEXT OF ENGLISH ABSTRACT: This paper presents the heat transfer experiments to liquid metal sodium flowing in a circular tube and annuli, showing the effect of eccentricity on the heat transfer coefficient and the peripheral temperature variation at the rod surface.

9717
CSO: 4009/423

AUTHOR: WANG Shuli [3769 5289 7812]
LI Jingtang [2621 2529 1016]
YU Guang [0060 1639]

ORG: All of Northeast Institute of Technology

TITLE: "Equilibrium Oxygen Pressure of LD Converter Slag Measured with Oxygen Sensor"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 1-5

TEXT OF ENGLISH ABSTRACT: The oxidizing ability of a steelmaking slag can be expressed in terms of its oxygen pressure. The use of an oxygen sensor with solid electrolyte makes direct and quick determination of oxygen pressure without having to sample and analyze the slag. Among the oxide constituents of steelmaking slags CaO, SiO_2, Al_2O_3, MgO, etc., all are more stable than iron oxides at steelmaking temperatures. Accordingly, the measured oxygen pressure of a slag should be closely related to iron oxides in the slag. Measurements were made on experimental slags under different gas atmospheres in the furnace. It was found that the oxygen pressure of an experimental slag was higher the oxygen atmosphere than under other atmospheres. The oxygen pressure of the experimental slag increased slightly with an increase of ferric oxide under the oxidizing atmosphere, and was mainly affected by the total ferrous oxide in the slag under an argon atmosphere. It increased slightly with the increase of the total ferric oxide in the slag under a reducing

[Continuation of GANGTIE No 5, 1981 pp 1-5]

atmosphere. The oxygen pressure under a highly reducing atmosphere is lower than under other atmospheres when the slag contains an equal ferrous oxide content.

AUTHOR: LIN Zongcai [2651 1350 1752]
ZHOU Rongzhang [0719 2837 4545]
HONG Congjia [3163 1789 3946]
LI Hui [2621 1979]
HUANG Ye [7806 8518]
WANG Yuanhao [3769 0337 3185]

ORG: LIN, ZHOU, HONG, LI and HUANG all of the Beijing University of Iron and Steel Technology; WANG of Baotou Metallurgical Research Institute

TITLE: "Laboratory Investigation of Nb Extraction from Molten Iron Containing High Phosphorus"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 6-9

TEXT OF ENGLISH ABSTRACT: An investigation has been made of the recovery of niobium from high phosphorus hot metal in the laboratory. It was shown that the control of the bath temperature from the beginning to the end of blowing is very important and that only in cases of good kinetic conditions can the order of oxidation of elements correspond to thermodynamics, with more ideal selective oxidation being obtained. The number of oxygen nozzles and their distribution in the furnace bottom strongly affect the speed of mixing in the bath as well as kinetic conditions.

AUTHOR: CHEN Yongding [7115 3057 1353]
DENG Kaiwen [6772 7030 2429]
QIAN Guojun [6929 0948 6874]

ORG: All of the Central Iron and Steel Research Institute

TITLE: "Nb Extraction from Hot Metal Containing Nb and P by Oxygen Bottom-blown Process"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 10-14

TEXT OF ENGLISH ABSTRACT: Slags of high Nb_2O_5, low P_2O_5, high Nb/P ratio and low FeO content have been obtained from hot metal containing Nb and P in 300 kg, 3 and 5 ton experimental oxygen bottom-blown converters. The bottom-blown process showed a good selective oxidation performance. The FeO and P_2O_5 formed at the high oxygen-potential zone near the tuyeres are reduced in the course of ascending by the elements present in the bath that have a higher affinity toward oxygen than do Fe and P. The effects of temperature, depth of metal bath, and diameter of tuyeres on selective oxidation in the bottom-blown process are discussed.

AUTHOR: ZHANG Huitang [1728 1920 2768]
JIA Zongsheng [6328 1350 3932]
LUO Dinghai [5012 1353 3189]
SU Yunqing [5685 0061 3237]

ORG: ZHANG and JIA both of the Central Iron and Steel Research Institute; LUO and Su both of the Zunyi Ferro Alloy Plant

TITLE: "Making Medium-low Carbon Ferro-Manganese in Basic Oxygen Furnace"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 15-20

TEXT OF ENGLISH ABSTRACT: The key to making medium-low carbon ferromanganese in the basic oxygen furnace is "decarburizing and keeping manganese." A semi-industrial experiment was carried out in a 0.8 ton converter, using hot high-carbon ferromanganese as a raw material. The temperature was controlled in the range of 1750-1960°C, the oxygen consumption about 120-180 m^3/ton, and slag basicity (CaO/SiO_2) 1.1 - 1.2. The carbon content in the products was less than 1.5 percent. The recovery of manganese in all the testing heats was more than 80 percent. In comparison with the silico-thermit process for making medium-low carbon ferromanganese in technology and economy, the process has more advantages.

AUTHOR: CAI Zhipeng [5591 1807 7720]
MA Enxiang [7456 1869 4382]
YANG Jianqing [2799 0494 7230]
QIAN Zhanmin [6929 0594 3046]

ORG: All of the Institute of Chemical Metallurgy, Chinese Academy of Sciences

TITLE: "Hydrodynamic Modeling of Stirred Desulfurization"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 21-27

TEXT OF ENGLISH ABSTRACT: The mixing phenomenon of powdered desulfurizing agents in liquid iron with a rod stirrer was investigated by means of hydrodynamic modeling with special bubbling-polymerized styrene particles, and an aqueous solution of glycerine. Particle concentration was measured automatically with a helium-neon laser. The relationship between the relative differential concentration of the particles, $(C_0-C)/C_0$, and the modified Froud Number, F'_r, was established by varying the vessel diameter, D_0, depth of charge, H_0, rod diameter, d, its eccentricity, a, and immersion depth, h, and the rotational speed, N, of stirring, as follows: $\frac{C_0-C}{C_0} \times 100 = \exp\left\{4.6 - 840 \left[F'r \frac{(2a+d)^2}{D_0H_0}\right]\right\}$. Experimental results indicated that increasing the rod diameter did not affect the relative mixing concentration, in the range $1/6 \geq d/D_0 \geq 1/12$. But C/C_0 reached a maximum when h/H_0 = 1/5 - 1/3. If the depth of immersion exceeded the above value, however, C/C_0

[Continuation of GANGTIE No 5, 1981 pp 21-27]

decreased. The optimal eccentricity of the rod stirrer was $2a/D_0 = 1/3 - 1/2$, and the optimal depth of charge was $H_0/D_0 = 1/2 \sim 4/5$. When the modified Froud Number is increased over a certain value, splashing increases seriously. The above conclusions are in good agreement with hot model experiments and may be proposed for scale-up.

AUTHOR: ZHANG Huaijun [1728 2037 8823]

ORG: Research Institute of Shanghai Steel Works No 5

TITLE: "A Study on Countercurrent Continuous Steelmaking"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 28-32

TEXT OF ENGLISH ABSTRACT: Fifteen tests totaling 2640 minutes were performed on a trial plant using a countercurrent stream of oxide slag. The trial plant consisted of a refining channel equipped with 5-6 top blowing oxygen lances, with an output of 2.5 t/h. Tests were made with medium and high P pig iron. As the molten iron was continuously fed into the plant, steel was directly tapped through a siphon spout at the other end. The experiments with the countercurrent principle showed that up to 99.8 percent P and 87 percent S can be removed. The end P content can be lowered to 0.001 percent and desulfidation via gasification can be easily realized. Other advantages include less consumption of raw materials, better thermal efficiency and lower lining wear rate. Calculations confirmed that the above refining effects still have not reached the ideal state. Therefore, this method is thought to be specially suited to the production of super-pure steel.

AUTHOR: SHI Chenxing [0670 1368 5281]
YAN Ruiying [7051 3843 5391]
XU Xuezheng [1776 1331 2398]
LI Peizhang [2621 0160 3864]
LOU Kai [1236 6963]

ORG: SHI, YAN and XU all of Capital Iron and Steel Company; LI and LOU both of Baotou Metallurgy Research Institute

TITLE: "An Experimental Study of Rare Earth Metal Additions in the Continuous Casting Process"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 33-38

TEXT OF ENGLISH ABSTRACT: A method of rare earth metal (REM) addition during continuous casting of billets has been developed for the twinstrand caster at the experimental works of the Capital Iron and Steel Company be feeding mischmetal wire into the mold under a protective atmosphere. Experiments were carried out to compare the quality of steel so treated with steel to which no REM had been added. It was discovered that the yield of REM in steel was more than 80 percent and the distribution of REM in the steel was relatively uniform. The solidification structure of the billet with REM was dense, the sensitivity toward internal cracks was reduced greatly and the steel with REM additions was comparatively clean. Since the inclusions in the steel had become small and hard to deform REM containing inclusions, the traverse impact value of the product was markedly improved.

AUTHOR: YIN Ruiyu [3009 3843 6877]
DENG Shaoyan [6772 4801 1177]
XU Guolun [1776 0948 0243]
WANG Haizhi [3769 3189 0037]

ORG: All of the Research Institute of Tangshan Iron and Steel Company

TITLE: "The Solidification and Structure of Semi-killed Low Alloy Steel Ingot 20 MnNb(b) and 25MnNb(b)"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 39-45

TEXT OF ENGLISH ABSTRACT: This article is based on a pilot run of semi-killed ingots of a small size (about 10 inches across). The following aspects are discussed: 1. The effect of segregation of elements on the structure of semi-killed low alloy steel ingots, taking into consideration the peritectic reaction. 2. The conditions of subsurface hole formation in semi-killed low alloy steel ingots. 3. The "hydrogen" semi-killed ingot structure.

AUTHOR: DOU Shixue [4535 1102 1331]

ORG: Northeast Institute of Technology

TITLE: "Structure and Thermodynamic Properties of Silicate Melts"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 5, 1981 pp 59-67

TEXT OF ENGLISH ABSTRACT: This paper reviews the structure-based thermodynamic models of binary silicates. These models include: Toop and Samis' approach to polymerization-depolymerization equilibrium involving the three forms of oxygen occurring in silicate metals; Masson, Smith and Whiteway's polymerization theory; Kapoor and Frohberg's statistical mechanical calculation; Yokokawa and Niwa's statistical approach; Borgianni and Granati's Monte Carlo calculation; and Lin and Pelton's silicon-oxygen bridge model. These models are discussed and compared by means of the results obtained of activity, mixing free energy and anion distribution. The advantage of the polymer theory over any other is the provision of a direct link between ionic constitution and the thermodynamic properties up to the composition of the formation of the ring structure. The major advantage of Lin and Pelton's model is that it is not restricted to composition of polymer theory. The Monte Carlo calculation will become a potential method in liquid structural research.

9717
CSO: 4009/378

AUTHOR: YAN Haixing [0917 3189 2502]

ORG: Institute of Mechanics, Chinese Academy of Sciences

TITLE: "The Vibrational Relaxation Processes in CO_2-N_2-H_2O Laser System"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 6, Jun 81 pp 1-8

TEXT OF ENGLISH ABSTRACT: Vibrational relaxation processes and data of the CO_2-N_2-H_2O laser system up to now are surveyed. The data before 1968 are based on Taylor and Bitterman's review. The data are treated with the weighed least square method to get the best fit in the form of $\log_{10}K = A + BX + CX^2 + DX^3$, and the corresponding coefficients are presented. Using these best fits of data and a relaxation model with three modes and four vibrational temperatures based on the present work, numerical calculation results of small signal gain of GDL agree with those of the experiments, thus eliminating the error introduced by the uncertainties of the relaxation data and model.

AUTHOR: SHAN Zhenguo [0830 2182 0948]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Research on Infrared Transmission of GaAlAs/GaAs DH Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 6, Jun 81 pp 23-27

TEXT OF ENGLISH ABSTRACT: In this paper we describe the arrangement and principle of the infrared transmission technique and report the main results obtained. Our experiments show that the technique is another useful tool in the study of GaAlAs/GaAs DH lasers. The comprehensive photographs obtained, including the epitaxial layers, the structure near the stripe region and emissive pattern of the active region, could not be obtained previously with ordinary microscopes or scanning-electron microscopes.

AUTHOR: ZHAO Yanzeng [6392 3601 2582]
WU Shaoming [0124 1421 2494]

ORG: Both of the Institute of Atmospheric Physics, Chinese Academy of Sciences

TITLE: "Effects of Chromium Ion Concentration on the Threshold and Output Energy of Dye Q-switched Ruby Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 6, Jun 81 pp 28-31

TEXT OF ENGLISH ABSTRACT: It is shown that there is always a minimum on the threshold-concentration plot for dye Q-switched ruby lasers, which increases with the increasing ratio of cavity loss to ruby length and decreases with the increasing ruby diameter. Efficiency of the Q-switched ruby device increases with chromium concentration in a considerably wide range.

9717
CSO: 4009/424

AUTHOR: LIANG Kejun [2733 0344 0971]

ORG: Northeast Institute of Technology

TITLE: "Technological Developments in Chinese Open Pit Metal Mining"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 7-13

TEXT OF ENGLISH ABSTRACT: Modern open pits in China appeared at the beginning of the 20th century. Development of new drilling equipment began in 1958, and in the 70's they began to replace older open pit drilling equipment. At present, rotary drills are employed at large open pits and down the hold hammer drills at medium and small open pits. The churn drill is being eliminated.

Blasting technology has made rapid progress since 1956. In recent years it has been approaching advanced levels of the world in several fields: multiple-short-delay blasting, new explosives and large-scale chamber blast, etc.

The principal loading equipment at Chinese open pits is the 4 m^3 electric shovel. The output of advanced shovels exceeds 1.0 million tons/m^3/year. Now larger shovels with 10~15 m^3 bucket capacity, bucket wheel excavators and front-end-loaders with 5 m^3 capacity are manufactured.

Rail transport is popular in Chinese open pits and much experience has been gained. Truck haulage is widely employed and the use of Chinese trucks is increasing.

[Continuation of YOUSE JINSHU No 2, 1981 pp 7-13]

Great interest is shown in the use of ore passes and belt conveyors in haulage.

Significant achievements have been obtained in many fields of open pit operation, for example, open pit design theory, technical measures to raise overall production capacity, computer applications, mine system engineering and open pit slope stability, etc.

AUTHOR: WANG Xiangbao [3076 1651 1405]
WANG Mingdao [3769 2494 6670]
CHEN Xingzhuo [7115 2502 8743]

ORG: WANG Xiangbao of Jiaotong University, Shanghai; WANG Mingdao and CHEN both of Wuhan Institute of Iron and Steel Technology

TITLE: "A Calculation of the Stress in the Friction Wheel of a Koepe Multi-rope Hoist by the Finite Element Method on an Electronic Computer"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 14-20

TEXT OF ENGLISH ABSTRACT: The present article sums up the authors' work on the calculation of stress in the friction wheel of the Koepe multi-rope hoist by the finite element method. A comparison of the authors' calculated results represented by the radial flexure curve appearing in this article with the well-known calculated data by O. Popowicz of Germany shows that the former agrees closer with the actual situation. The pattern of the stress distribution found in the present work not only responds to the corresponding effect of the bending moments, but also responds figuratively to the location of action of the friction lining.

As shown by the calculated results, the bending moment and the stress levels for the friction wheel are far below those for the drum of a single-rope hoist. This is because each of the several ropes of the Koepe hoist shares a smaller tension

[Continuation of YOUSE JINSHU No 2, 1981 pp 14-20]

and the friction lining reduces the uniformly distributed load on the friction wheel caused by the ropes. Intermittent action also helps to result in lower loads.

In the last part of the article, it is concluded that the strength of the friction wheel is not necessarily the crucial point in design since the bending moment and stress levels are low. Instead, the authors suggest that a thorough study of the stability of the friction wheel and the residual stress in the welded seams be unfolded.

AUTHOR: FU Zhirong [1381 3112 2837]

ORG: Research Institute of Mining and Metallurgy, Changsha

TITLE: "The Application of Superspeed Photography in Parametric Measurement of Industrial Explosive Detonation"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 21-25

TEXT OF ENGLISH ABSTRACT: The application of superspeed photographical techniques in measuring detonation parameters of an industrial explosive is described in this paper. Based on the different characteristics of industrial explosives, the various explosive-loading constructions and photographical methods were designed. The measuring problems of the detonating process of industrial explosives and blasting devices were solved. The measurement of the detonating velocity of industrial explosives, the transmission time of the detonating wave of the industrial explosive, lateral diffusive velocity, observation of high frame photography, calculations and analysis of photographical results, etc., are related.

AUTHOR: ZHAO Changli [6392 7022 0500]

ORG: Guangzhou Research Institute of Nonferrous Metals

TITLE: "Magnetic Separator of Vertical Ring Type and Its Application"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 37-43

TEXT OF ENGLISH ABSTRACT: This paper describes the structure, performance and separating effect of the vertical ring magnetic separator for weakly magnetizable minerals.

The special feature of the unit is the movement of the separating ring around a horizontal axis. The direction of pulp flow at the bottom feed section of the ring is in opposition to that at the top discharge section (relative to the ring). The ball matrix in the separating chamber turns over after the completion of its separation process every time, making impurities and strong magnetic minerals discharge easily, which often block the matrix space in the horizontal ring type. The blockage problem of the separating annular chamber can be better solved and, concurrently, the auxiliary apparatus reduced, simplifying the flowsheet.

This machine adopts an enclosed magnetic circuit shaped like the Chinese character 日. The unit is small, light and smooth, having a low center of gravity and compact structure. The intensity of the magnetic field is 17,000-20,000 gauss and

[Continuation of YOUSE JINSHU No 2, 1981 pp 37-43]

the unit performance is good. When it was used to separate limonite, a concentrate grading 55.3 percent Fe with a recovery of 88.08 percent was achieved from a feed of 46.15 percent Fe; in separating tailing slimes containing stromite and manganocalcite, a manganese concentrate assaying 21.23 percent Mn with a recovery of 63.47 percent was obtained from a raw material containing 11.30 percent Mn through one roughing and cleaning respectively. Good results can also be obtained from separating wolframite, niobite, spodumene, hornblende, etc.

AUTHOR: CHEN Tingzhong [7115 1656 0022]
XU Jingqian [1776 6975 3383]

ORG: Both of the Southcentral Institute of Mining and Metallurgy

TITLE: "The Technique for Measuring Flowing Film Rate"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 44-47

TEXT OF ENGLISH ABSTRACT: In this paper, an experimental apparatus designed by the authors for measuring flowing film rate is presented which is composed of a microelectrode, milliammeter, lightwave oscilloscope and measuring electric circuit. The working principle of the apparatus is based on that fact that an electrolyte added to the flowing film to be measured flows with it at the same rate. A pair of microelectrodes specially adapted are installed in the flowing film so as to stay apart by a certain distance along its direction. The conductivity of the fluid medium is improved, thus inducing a change of signals in the measuring circuit as the electrolytic solution flows together with the flowing film. A complete process of the signal change may automatically be recorded with a lightwave oscilloscope, thus the time consumed by the electrolyte in passing through the electrodes can be accurately determined and calculation of the flowing film rate may be made possible through a standard formula. This apparatus can be used to measure a flowing film rate not only under general conditions, but also under a revolving force field.

AUTHOR: LUO Qian [5012 5541]

ORG: Northeast Institute of Technology

TITLE: "Centrifugal Separator for Beneficiation Iron Ore Slimes"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 48-53

TEXT OF ENGLISH ABSTRACT: In 1964, a centrifugal separator was successfully developed by the Yunnan Tin Mining Company, China. Since then, this type of separator, simple in structure and reliable in operation, has been used for separating tungsten and tin ore slimes and has achieved good results.

Experiments conducted for many years showed that centrifugal separators can also be used successfully for separating iron ore slimes. A concentrator, treating 3 million tons of ore per year and built in 1975 at Gongchangling Iron Mine, Anshan Mining Company, has adopted the combined flowsheet of magnetic separation followed by gravitation (spiral chutes and centrifugal separators) for treatment of composite magnetite-martite ore. When treating the ore feed grading of 13.9 percent Fe, the centrifugal separator can produce a concentrate assaying 63.2 percent Fe with recovery of 43 percent Fe in this operation.

The centrifugal separator can also be utilized for other types of iron ore, the lower size limit for effective recovery being 10 microns.

AUTHOR: TIAN Encheng

ORG: Huludao Zinc Plant

TITLE: "Measurement of Sintering Temperatures of Some Zinc Concentrates in Fluidized-bed Roasting"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 60-64, 13

TEXT OF ENGLISH ABSTRACT: The crux of high temperature oxidizing roasting of zinc concentrates in a fluidized bed is controlling their sintering temperatures accurately. Having measured sintering temperatures of some zinc concentrates in fluidized-bed roasting, we proposed for the first time that the concentrates be classified into five categories by their sintering points, thus contributing to choosing the proper fluidized-bed roasting temperatures. The sintering points are of five kinds: superhigh, high, intermediate, low and ultralow. The factors affecting the sintering temperatures of zinc concentrates and approaches toward their improvement are also shown.

AUTHOR: TIAN Fuchun [3944 4395 4783]
KANG Yu [1660 3842]

ORG: Both of the Beijing Mining and Metallurgical Research Institute

TITLE: "Application of Mineralogy to Extractive Metallurgy--On the Recovery of Cobalt from Copper-Nickel Converter Slags"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 65-71

TEXT OF ENGLISH ABSTRACT: Mineralogy and microstructure of the slow cooling cobalt matte from scavenging liquid converter slags by reduction and sulfidization in an electric furance are studied. Physical and chemical reactions during smelting are discussed based upon mineralogy of the matte and distribution of cobalt in the matte. It is shown on phase relations that cobalt matte containing 22-25 percent Fe and 20-22 percent S may be obtained and about 90 percent of the total cobalt can be reduced to the metallic phase by controlling conditions of reduction. As viewed from mineralogy, a process proposed by our institute is appropriate for recovery of cobalt from the converter slag. The process is as follows: reducing smelting in the electric furnace, slowly cooling the metallized cobalt matte, concentrating by flotation, sulfuric acid pressure leaching, separating of cobalt from nickel by P204 solvent extraction, reducing to cobalt powder with hydrogen, etc.

The mineral components of two cobalt mattes obtained using nickel-bearing pyrite and calcined nickel concentrate as a sulfidizing solvent are examined. The ratio of

[Continuation of YOUSE JINSHU No 2, 1981 pp 65-71]

nickel to cobalt in the matte is approximately 8:1 for the latter solvent and 3.5:1 for the former. In the case of the latter, precious metals Pt and Pd entrained into the alloy phase by the calcine are lost in the leaching slag. Furthermore, the sulfur in cobalt matte is less than 20 percent and the alloy assay of the matte is 45-50 percent, so that the melting point of the matte will rise greatly. Thus it is more suitable to adopt nickel-bearing pyrite as a sulfidization solvent in the electric furnace smelting than to adopt the calcine.

AUTHOR: JI Chunlin [0370 2504 7207]
SUI Zhitong [7151 2535 6639]

ORG: Both of Northeast Institute of Technology

TITLE: "Transportation of Iron Compounds through Gas-phase Reaction during the Reduction Process of $ZrCl_{4(g)}$ with Metallic Magnesium--Application of Chemical Thermodynamics to Metallurgy (I)"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 72-79

TEXT OF ENGLISH ABSTRACT: The variations of the ratios n_{Fe}/n_{Zr}, n_{Hf}/n_{Zr}, n_{Si}/n_{Zr} and n_{Al}/n_{Zr} for zircon, intermediate and final products in the metallurgy of sponge zirconium demonstrated that Fe behaved rather differently than did the other impurities, i.e., Hf, Si and Al. Iron could "sneak into" sponge zirconium in the final reduction procedure of $ZrCl_{4(g)}$ with metallic magnesium. It has long been believed that interaction between reduced sponge zirconium and the stainless steel container was the main cause responsible for the super-contamination of sponge zirconium by iron. However, using zirconium containers instead of stainless steel ones could not stop sponge zirconium from being super-contaminated by iron. Thermodynamic calculations based on operational data revealed the presence of the transporting process of iron chloride through the gas-phase into the reduction container where iron was reduced and contaminated the sponge zirconium. Iron chloride was produced by reactions taking place between the $ZrCl_4$ vapor and iron oxide film

[Continuation of YOUSE JINSHU No 2, 1981 pp 72-79]

on surfaces of containers as well as reactors. In addition, the product hydrolyzed, $ZrOCl \cdot 8H_2O$, entering the reactors would be responsible for the formation of iron oxide film on these surfaces.

AUTHOR: ZHANG Yukui [1728 3768 1145]

ORG: Xiaosigou Smelter of Nonferrous Metals, Hebei

TITLE: "Behavior of Sodium Sulfate during Roasting of Copper Sulfide Concentrates"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 2, 1981 pp 80-84, 79

TEXT OF ENGLISH ABSTRACT: In small copper hydrometallurgical plants, the roasting-leaching-electrowinning route is generally followed. The clarification of pulp after leaching is prompted by adding in situ polyacrylamide into the leaching tank equipped with a mechanical agitator. Concerning the treating of some types of copper concentrates containing much calcium and magnesium (in the form of carbonates), due to insufficient decomposition of these carbonates during roasting, it is obvious that evolution of bubbles in the course of clarification of the pulp will seriously hinder the clarification. This causes considerable trouble in the leaching operation. In order to promote the decomposition of those carbonates and convert them into sulfates, it is necessary to raise the temperature of roasting, but this will lead to the formation of much copper ferrite.

In the roasting process, by adding 1.3 - 1.7 percent mirabilite into the fluid bed roaster feeds, we succeeded in raising the roasting temperature by 50-80°C. Mirabilite appears to play a certain role in promoting copper sulfation during

[Continuation of YOUSE JINSHU No 2, 1981 pp 80-84, 79]

roasting at higher temperatures, and promoting sulfation of calcium and magnesium carbonates, resulting in the reduction of bubbling in the clarification of pulp.

During roasting sodium sulfate can increase the particle size of calcine by congregating the calcine particles together, thus reducing the dust formation during fluid-bed roasting.

9717
CSO: 4009/362

AUTHOR: WANG Caidang [3769 6846 3981]
WANG Jinsheng [3769 6855 4141]
LI Guoheng [2621 0948 5899]
YAN Yongyao [7051 3057 5069]
WANG Baolin [3769 1405 2651]
XU Yongsui [1776 3057 4840]

ORG: WANG Caidang, WANG Jinsheng, LI and YAN all of the Changjiang Ship Design Institute; WANG Baolin and XU both of the Wuhan Institute of Water Transportation Engineering

TITLE: "On the Trend toward the Development of the Push-train of the Lower Changjiang River in the Near Future"

SOURCE: Wuxi ZHONGGUO ZAOCHUAN [SHIPBUILDING OF CHINA] in Chinese No 3, Jul 81 pp 34-45

TEXT OF ENGLISH ABSTRACT: This paper describes a large amount of technical and economical analysis of push-trains of the lower Changjiang River. These analyses were conducted by the authors with the aid of a computer.

The comprehensive economic index E is used to assess the economic effect of the push-train scheme, while the resistance of the push-train is calculated with a new method proposed by the authors. The influence of the structure of the transportation cost on the economy of the push-train is analyzed in terms of the optimum

[Continuation of ZHONGGUO ZAOCHUAN No 3, Jul 81 pp 34-45]

matching functional relationship among the power of a pusher, crew wage, number of pushers and fuel cost per ton, as well as the data of calculation of many examples. It is indicated that the structure of the transportation cost of the push-train is one of the decisive factors determining both the power of a pusher and the scale of a push-train. Based on the results of calculations and analyses of more than 20,000 schemes, the paper points out that according to the structure of the transportation cost and the annual freight throughput of the lower Changjiang River at the present time and in the foreseeable future, it can achieve an optimum economic effect in developing the 2 x 4 push-train (of the 2000 t. barge), consisting of 1200-1800 horsepower pushers, and the 2 x 2 push-train (of the 2000 t. barge), consisting of 540-1200 horsepower pushers on the lower Changjiang River now and in the near future.

AUTHOR: YE Xisheng [5509 1585 5110]
ZHOU Ruyu [0719 1172 6877]
CHEN Gaozeng [7115 7559 1073]
FENG Ruyuan [7458 1172 6678]

ORG: All of the Shanghai Ship and Shipping Research Institute

TITLE: "A Method for Calculating Wave-induced Bending Moment on Sea-going Ship Hulls"

SOURCE: Wuxi ZHONGGUO ZAOCHUAN [SHIPBUILDING OF CHINA] in Chinese No 3, Jul 81 pp 55-64

TEXT OF ENGLISH ABSTRACT: In this paper, the predicted wave-induced bending moment for six groups of ships was calculated by using the strip method and statistical wave information of the North Atlantic. Each of the groups consists of 30 ships of the same length with the characteristics of these ships corresponding to those of 30 existing ships, including dry cargo ships, bulk carriers, tankers and passenger ships, etc. The ship lengths of the six groups are 100 m, 150 m, 200 m, 250 m, 300 m and 350 m respectively.

Based on an analysis of the effects of ship length and block coefficient, a simple formula for calculating the wave-induced bending moment has been suggested. It is similar to that used in Classification Societies Rules and could be used as a reference for ship design.

9717
CSO: 4009/453

END

JPRS 79047

23 September 1981

China Report

SCIENCE AND TECHNOLOGY

No. 128

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79047

23 September 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 128

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Equipment Design Must Incorporate Ease of Operation
(Xiong Jiayu; GONGCHENG JIXIE, No 6, 1981)........................ 1

PUBLICATIONS

Table of Contents of 'HUAXUE XUEBAO' No 2, 1981
(HUAXUE XUEBAO, Apr 81).. 7

Table of Contents of 'GAOFENZI TONGXUN' No 3, 1981
(GAOFENZI TONGXUN, Jun 81)....................................... 9

Table of Contents of 'DIWEN WULI' Vol 3 No 2, 1981
(DIWEN WULI, Jun 81)... 11

Table of Contents of 'WULI XUEBAO' No 6, 1981
(WULI XUEBAO, Jun 81).. 13

Table of Contents of 'QICHE JISHU' No 7, 1981
(QICHE JISHU, 25 Jul 81)... 16

ABSTRACTS

CIVIL ENGINEERING

TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL], No 2,
1981... 18

ELECTRONICS

DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS], No 8, 1981.. 23

GEOGRAPHY

DILI XUEBAO [ACTA GEOGRAPHICA SINICA], No 2, 1981........................ 25

DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE], No 7, Jul 81...................... 31

INTERNAL COMBUSTION ENGINE ENGINEERING

NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING], No 2, 1981.. 33

NUCLEAR PHYSICS

YUANZI HEWULI [CHINESE JOURNAL OF NUCLEAR PHYSICS], No 3, Aug 81........ 38

PETROLEUM

SHIYOU XUEBAO [ACTA PETROLEI SINICA], No 3, 1981.......................... 40

SOLAR ENERGY

TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA], No 3, Jul 81......... 45

TRANSPORTATION

XIANDAIHUA [MODERNIZATION], No 8, 16 Aug 81.............................. 46

EQUIPMENT DESIGN MUST INCORPORATE EASE OF OPERATION

Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 6, 1981 pp 30-33

[Article by Xiong Jiayu [3574 1367 6877] of the Shanghai Electronics Technology School: "Mechanical Operating Devices Should Suit Man's Physiological Characteristics"]

[Text] Human operations are a sensory process. The worker senses the operation, movement, and changes of equipment via related displays of instruments, signals, or regular sounds and direct observation. Next, through the thought process he makes the correct judgment and decision, and then he uses the movement of his muscles to carry out the operation or to compare and correct the results of the operation. Finally he engages in controlling or regulating movements so that the equipment can operate normally according to its regulated movements. Therefore, controlling equipment is a sensory process of man's thoughts and muscular activity. Mechanical operating devices must operate normally and smoothly in coordination with the sensory process. This requires that the parameters of shape, size, weight, elasticity, inertia, and height of installation should be suited as much as possible to man's operating position, the relative position, and the direction of the application of force, thus enabling the operator to exert the most suitable amount of force and amount of motion and enabling him to control and regulate the equipment with a high degree of accuracy. We will give a brief description of man's physiological characteristics as related to the problems concerned.

I. Height of Operating Installation

The average height of our nation's men is 1.67 meters and that of women is 1.56 meters. The height of the people of each region varies. People in Inner Mongolia, Shandong, and Hebei are taller--2 centimeters taller than the average. People in the middle and lower reaches of Changjiang, Shaanxi, Gansu, Xichuan, Fujian, Guangdong, and Guizhou are shorter. The height of entire operating installations should not be greater than the average height of people; generally, 1.8 meters is a good height. Installations lower than 1.3 meters should be set on a working table or on a support so that the total height will be about 1.8 meters. The width of the entire operating installation should be slightly wider than the distance between the two shoulders of the human body (generally 0.6 meters), but not more than 1 meter.

II. Equipment and Vision

The wavelength of visible light seen by the human eye is 300 to 800 micromillimeters. The horizontal range of vision is 140° to 160°. The vertical range is from 50° above the horizontal line of vision to 80° below the horizontal line of vision, a total of about 130°. The visual angle of different colors is between 40° to 180°, as shown in the following table.

Visual Angles of Different Colors of the Human Eye (Degree)

Color	White	Yellow	Blue	Red	Green
Direction					
Horizontal	180	120	100	60	60
Vertical	130	95	80	45	40

The human eye is highly adaptive to variations of brightness and darkness. Walking from a bright place to a dark place, it can recognize a 0.03 lambert light spot; within 30 minutes, the human eye's light sensitivity will increase 15,000 times. Adaptation to brightness or weakness of light can be effectuated in 6 to 8 minutes.

The cones of the human eye contain three photosensitive chemicals that are sensitive to red, green, and blue. When the eye sees red, the red-sensitive chemicals break down and create the sensation of red. When the eye sees green, the green-sensitive chemicals decompose to create the sense of green. When red and green colors are seen simultaneously by the eye, the color-sensitive chemicals decompose according to a definite proportion to create the sense of yellow. If there is a deficiency of a given color-sensitive chemical, the person is colorblind. The human eye is most sensitive to the blue-green light of 510-micromillimeter wavelength during the daytime.

To adapt to the characteristics of the ability of the human eye to recognize colors and of the reaction speed, red usually is used for machinery and instruments with a color display to indicate positive voltage, prohibition from use, dangerous working conditions, emergency control devices, movements not allowed or incorrect... to indicate the limits which normal operating conditions should not exceed. Green indicates normal operating states, allowing operation, or allowing the use of certain controlling devices. White, milky white, and opaque colors indicate connection to power sources, preheated states, or preparation for startup and preparation for operation. Blue indicates negative voltage or indicates that the entire machine has operated its full cycle.

To increase the clarity and brightness of the indicators or the display signal, a yellow or orange color filter frequently is installed on the meter or the display.

To reduce the visual fatigue of the operator and to facilitate reading, the lighting is commonly covered by a shade to avoid having to see the light source directly, or the light source is placed behind a semitransparent meter. The brightness of the meter must be even, and the surface of the material of the meter should have no luster and should not reflect light. The contrast is greatest between the meter and its rim.

Automatic alarm indicators utilizing light signals must use colors different from those indicating normal operation. They are more outstanding and cause people to be alert. The light-emission frequency should be 3 to 10 times a second. The duration of light emission should not be shorter than 0.05 seconds.

Indicators should be set up at the most beneficial position on the horizontal line of vision. When the operator works in a standing position, the indicators should be 1.45 to 1.5 meters from the ground; when he is working in a seated position, they should be 1.1 to 1.2 meters from the ground. Installation of many indicators should be carried out according to the visual range of the human eye. The left and the right sides must not be over 0.35 meters from the eye, and the meters should be arranged symmetrically and in an orderly fashion as much as possible, and placed from left to right according to the operating procedures in order to facilitate the human eyes' moving from left to right.

Normal vision can differentiate between two straight lines or two dots with graduations 0.1 millimeters apart on the face of a meter placed 0.3 meters in front [of the eye]. Overly fine graduations will cause visual fatigue; therefore the distance between two lines of graduations is generally 2 to 4 millimeters apart. The height of the graduation lines must be larger than 1.5 millimeters, while the height of letters and numbers should be greater than 2 millimeters.

III. Equipment and Hearing

The human ear can hear and differentiate mechanical vibrations between 16 and 20,000 hertz and can differentiate 1,500 types of different tones, 34 different sounds, and 325 different loudnesses. Not only is the human ear sensitive, but revival of hearing is also very quick--within 10 to 15 seconds.

The sound which the human ear can hear is called the hearing threshold. The sound that causes pain in the human ear is called the pain threshold. The interval between the hearing threshold and the pain threshold is 120 decibels. Sound varies from weak to strong, and decibel values vary from small to large. Generally in an environment of 30 to 40 decibels, an operator feels comfortable and calm. When it surpasses 50 to 60 decibels, one often loses concentration and begins to feel tired. When it is higher than 80 to 90 decibels, one feels uneasy and the noise interferes with normal operation. We can use sounds of some actual environments to explain the intensity of sound. For example, at night when it is quiet, the rustling sound of tree branches brushing against each other is about 20 decibels. Two persons murmuring make a sound of about 30 decibels. The sound in a technical design room or an office with six to eight persons is 40 to 50 decibels. In crowded streetcars or buses at the peak load period of passengers, the sound is about 70 to 80 decibels. In common machinery-manufacturing plants in our nation, the sound in a metallic processing shop is about 80 decibels, in an assembly shop it is about 90 decibels, in a punching shop it is about 100 decibels when using an air pick for cleaning castings, and when using an air hammer in forging, the sound reaches 110 decibels. The sound in an air compressor room sometimes reaches or surpasses 120 decibels. Figure 1 is the experimental curve of normal hearing of the human ear. The curve shows that the sense of hearing of the human ear is mainly related to the intensity of sound and the frequency of sound. The intensity of sound required to differentiate sound frequencies of 500 to 1,000 hertz is the smallest. But the duration of sound will also affect the ability to differentiate variations of sound intensity. The human ear normally hears sounds between 20 and 20,000 hertz in range of frequency; the differentiation is affected the most when a sound persists for 0.5 seconds or less. Later, hearing gradually adapts and the ability to differentiate drops. The drop in the ability of differentiation occurs more obviously at lower frequencies than at higher frequencies. When the sound intensity increases to about 120 decibels, a piercing sensation will be felt.

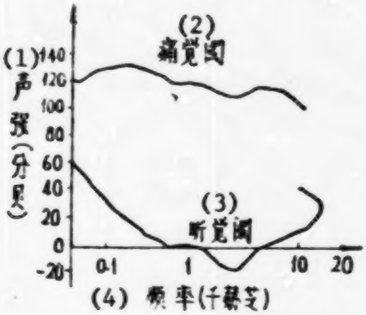


Figure 1 Range of hearing of the human ear

1. Sound intensity (decibels)
2. Pain threshold
3. Hearing threshold
4. Frequency (kilohertz)

The left ear and right ear hear differently, and the difference becomes greater as the frequency becomes higher. The human ear also varies in its ability to differentiate the direction of the source of sound. Generally it is easy to differentiate left and right directions and difficult to differentiate front and back directions. The source of a sound [whose origin] is not visible can be recognized by the human ear, but the accuracy is very low. Noise, such as screams, strange sounds, sounds of terror, sirens during air raids, and piercing sounds greater than 120 decibels, easily cause hearing fatigue in people and directly affect the emotions of the operator.

In a work environment, when visual observations are inconvenient, sounds of whistles, horns, or alarms of 1,000 hertz can be used as alarm indicators. The duration of the alarm should not be too long. The signal can be continuous or intermittent until repairmen arrive to shut the signal off.

IV. Operation of Equipment and Exertion of Force by the Human Body

The amount of force exerted by the human body determines the position of application of force and the direction of force. Man applies force mainly by relying upon the movement of muscles. The muscles of the male that are distributed on the four limbs and shoulders and the back of the human body constitute about 42 percent of the muscles of the entire body, while the muscles of the female constitute about 36 percent. The hands moving in front of the human body can exert the greatest force. A bent arm can exert all of the force of the arm at a height of about 20° above horizontal. When the arm is higher than 45° above horizontal or when the arm is hanging down, only 35 percent of the force of the arm can be exerted. The amount of force which can be exerted at different positions is shown in Figure 2.

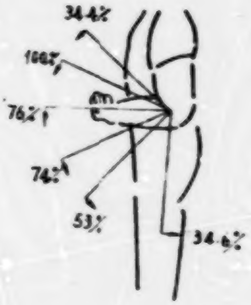


Figure 2

The operating device of a piece of equipment is most suitable when placed in front of the operator. When the operator is in a seated position, the force of pull toward the body is greater than when [he or she is] standing. The accuracy of application of force by the feet is similar to that of the hands. The strength varies according to the position of the feet. When [the legs are] stretched out straight, the force produced is greater than when the legs are bent. The greatest force is produced when there is a support. The application of force by the hands and feet is limited. Generally, the force controlled by the hands is not greater than 20 kilograms and the force controlled by the feet is not more than 30 kilograms; otherwise, the person becomes tired and his operating activity is affected.

The sensitivity of the human body to react to external stimuli is related to the duration of the stimuli and the skillfulness of operation. Within a definite degree, increasing the intensity of the stimuli upon the human body will lower the reaction time, but beyond this limiting value there will not be any effect. The operating motion can with repeated practice be shortened in time by 10 percent. The reaction time can also be shortened when there is a preparatory signal.

The reaction time of the human hand is shorter, and the right hand reacts more quickly than the left hand. The adaptability of the human hands to the external environment is slower than that of the feet. The hands and feet adapt easily to the senses of touch, pressure, temperature, and cold, but adaptability to pain is very slow. For example, when people wear clothes, they feel at first that their body is constricted, but after a very short time they adapt. When using warm water to wash the hands and feet, people feel the water is warm at first, but after several seconds they adapt. However, it is very difficult for the pain caused by a needle pricking the hand or feet to dissipate or for a person to adapt to it. During operation, constant physical contact with the operating device over a long period will cause fatigue and pain. Therefore, this should be prevented as much as possible.

The reaction speed of the human body slows as the person's age increases. Generally, human reactions are the sharpest between the ages of 25 and 45.

The reaction speed of the human hand is quicker in a horizontal position than in a vertical position. The right hand moves horizontally in a clockwise direction more conveniently than in a counterclockwise direction.

Equipment requiring a back-and-forth operation must take into consideration the fact that the time needed to realize the operating motion increases as the distance of the movement increases, but the time required to begin and terminate the motion is unrelated to the distance of the movement; it is a fixed and invariable numerical value.

In activities of operating with a load, the maximum speed of operation and the weight of the load being moved are inversely proportional, but the time required to achieve the maximum speed of the activity is directly proportional to the weight of the load.

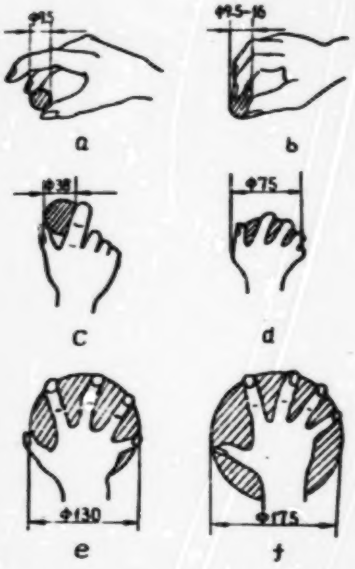


Figure 3

a. Operating with the thumb and middle finger
b. Operating with the thumb, index finger, and middle finger
c. Turning with the thumb and index finger
d. Five fingers operating the knob with the middle knuckles
e. Five fingers operating the knob with the fingertips
f. Five fingers operating the knob with the palm

Devices requiring the use of different parts of the fingers to operate, such as turning knobs, turning wheels, and round switches, must take into consideration the range of movement of the fingers in selecting the dimensions of the components. Figure 3 shows the appropriate dimensions of the components when using different parts of the fingers in operation.

Operations in cold regions must take into consideration the convenience of operation while one is wearing gloves, and the dimensions must be appropriately larger.

9296
CSO: 4008/447

TABLE OF CONTENTS OF 'HUAXUE XUEBAO' NO 2, 1981

Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese No 2, Apr 81 p 192

[Text] Huckel Spectrum of Conjugated Long-chain Molecules ......Tang Aoqing [0781 2407 1987], Yang Zhongzhi [2799 1813 1807] and Jiang Yuansheng [3068 0337 3932], all of the Theoretical Chemistry Institute, Jilin University, Changchun (97)

Empirical Estimation of Activation Energy for Free Radical Decomposition......Luo Yuran [5012 3254 3544], Department of Modern Chemistry, University of Science and Technology of China, Hefei (113)

The Calculation of Chemical Shifts of Condensed Aromatic Hydrocarbon Series. I. Additivity in the Proton Chemical Shifts of Condensed Benzenoid Aromatic Hydrocarbons...... Liu Chunwan [0491 2504 8001], Fujian Institute of the Structure of Matter, Chinese Academy of Sciences, Fuzhou (121)

A Study of the Mechanism of Fragmentation of Pyrrolizidine Alkaloids in Mass Spectrometry. I. Retusine, Spectabiline, Usaramine and Diacetyl-monocrotaline......Fang Yiwei [2455 0001 5517], Bian Zeliang [0593 0463 2733], Wang Guanghui [3769 0342 6540], et al., all of the Institute of Chemistry, Chinese Academy of Sciences, Beijing (139)

The Alkaloids of *Aconitum vilmorrianum* Kom. I. The Structures of Vilmorrianine A and C......Yang Chongren [2799 1504 0088], Hao Xiaojiang [6787 1420 3068], Wang Dezu [3769 1795 4371] and Zhou Jun [0719 0193], all of the Phytochemistry Laboratory, Kunming Institute of Botany, Chinese Academy of Sciences (147)

Structure of Antitubercular Compounds from *Ardisia japonica* (Thunb.) Blume......Hu Yan [5170 3601], Chen Wensen [7115 2429 2773] and Huang Buhan [7806 2975 3352], all of the South China Institute of Botany, Chinese Academy of Sciences, Guangzhou; Lin Longze [2651 7127 3419] and Xu Rensheng [1776

0117 3932], both of the Shanghai Institute of Materia Medica, Chinese Academy of Sciences (153)

Chemical Constituents of the Anticancer Plant *Thalictrum faberi* Ulber. I. Thalidasine and N-Desmethylthalidasine ......Lin Longze [2651 7127 3419], Fan Zhiyun [5400 5347 5366] and Song Chunqing [1345 4783 3237], et al., all of the Shanghai Institute of Materia Medica, Chinese Academy of Sciences (159)

The Synthesis of Anthraquinone Acrylic Acid Esters and Anthraquinone Acrylamides......Huang Zhendong [7806 2182 2639] and Yu Wenxian [0151 2429 2009], both of the Shanghai Institute of Industrial Hygiene (165)

The Total Synthesis of dl-10-Hydroxycamptothecin and dl-10-Methoxycamptothecin......Cai Junchao [5591 0193 6389], Shanghai Institute of Materia Medica, Chinese Academy of Sciences; Yin Mengguang [3009 1322 0342] and Min Aizhu [7036 1947 3796], both of the Shanghai No 5 Pharmaceutical Plant; Feng Dawei [7458 1129 3634], Shanghai Institute of Pharmaceutical Industrial Research; Zhang Xuexin [1728 5641 9515], Shanghai No 12 Pharmaceutical Plant (171)

Notes

Study on the Color Reaction of Magnesium Ion with Xylidyl Blue-1 in the Presence of Surfactants......Wang Qihua [3769 6386 5478] and Ma Rongsheng [7456 2837 3932], both of Zhejiang Institute of Metallurgy, Hangzhou (179)

A Study on the Mechanism of Adsorption of Uranyl Tricarbonate Ions by Zinc Hydroxide Carbonate......Han Jiancheng [7281 1696 2052], Research Group of Resources from Sea Water, Department of Chemistry, Eastern China Normal University, Shanghai (185)

9717
CSO: 4008/432

TABLE OF CONTENTS OF 'GAOFENZI TONGXUN' NO 3, 1981

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 3, Jun 81 p 160

[Text] Papers

A Distribution Function with Broad Applicability......Guan Shilin [7070 1129 2651] and Zhang Qinzhi [1728 3830 5347], both of the Jilin Chemical Fiber and Technology Institute (161)

The Interaction between Dye and Polyelectrolyte Energy Transfer and Enhancement of Fluorescence Intensity of Dye in the Polyelectrolyte-dye Complexes......Wu Shikang [0702 0013 1660] and Jiang Yongcai [1203 30572088], both of the Institute of Photographic Chemistry, Chinese Academy of Sciences (166)

Studies on Heat Stabilizer of Ethoxy (Polyphenyl)-Aryl Silanes......Du Zuodong [2629 0155 2767], Chen Jianhua [7115 0494 5478] and Shi Baochuan [0670 0202 1557], et al., all of the Department of Chemistry, Shandong University (174)

The Relationship between Number Average Molecular Weight and Viscosity of Poly (P-Phenylene Sulfide)......Jiang Shicheng [5592 0013 2110], Liu Zhiqing [0491 1807 3237] and Zhang Zhiying [1728 1807 5391], et al., all of Hebei Institute of Technology (180)

The Relationship between Thermal Stability and Chemical Structure of Polyimides......Liu Zhenhai [0491 2182 3189], Wu Yonglie [0702 1661 3525] and Jin Shufang [6855 3219 5364], et al., all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (186)

Investigation of the Formation of the Complex Catalyst in the Polymerization of Propylene......Xiao Shijing [5135 1102 6975], Han Shimin [7281 0013 2404] and Zhang Shuqing [1728 2579 3237], et al., all of the Institute of Chemistry, Chinese Academy of Sciences (194)

The Crystallization of Soft Segments of Polyether-based Segmented Copolymers......Shen Deyan [3088 1795 6056], Xu Duanfu [1776 4551 1133] and Wen Zaiqing [5113 0375 1987], et al., all of the Institute of Chemistry, Chinese Academy of Sciences (200)

A Study of the Curing Mechanism of Bis (2, 3-Epoxycyclopentyl) Ether and Bis-Phenol-A Epoxy Resin Mixture System......Jin Shijiu [6855 1102 0046] and Gu Juying [7357 5468 3841], both of the Institute of Chemistry, Chinese Academy of Sciences (206)

The Thermo-polymerization of N-Phenyl-Bicyclo [2.2.1] Hept-5-ene-2, 3-Dicarboximide......Wang Dong [3769 2639] and Huang Zhitang [7806 1807 6974], both of the Institute of Chemistry, Chinese Academy of Sciences (212)

Notes and Short Communications

Study of the Structure and Properties of Styrene-Butadiene-Styrene Triblock Copolymer by Two Stage Synthetic Process ......Wang Lizhen [3769 0500 4176], Fur and Leather Research Institute, Ministry of Light Industry; Deng Qiming [6772 0796 2494] and Chen Shulin [7115 3219 3829], both of the Footwear Research Institute, Ministry of Light Industry; Zuo Zhenyi [1563 2182 5065], Beijing Leather Shoe Manufacturing Factory No 2 (220)

The Effect of Polystyrene Sulfonic Acid on the Polymerization of Acrylamide......Wang Shenguo [3769 6500 0948], Xi Fu [5045 1788] and Li Zhifen [2621 1013 5358], all of the Institute of Chemistry, Chinese Academy of Sciences (224)

Syntheses and Spectra Studies of Bis-2, 2'-Bipyridine Ruthenium Complexes of Polymers......Huang Changkai [7806 7022 0418], Mo Qiwen [5459 0120 7186] and Liu Yunqi [0491 0061 0967], et al., all of the Institute of Chemistry, Chinese Academy of Sciences (228)

A Preliminary Evaluation of Photostabilization Ability of Poly (Styrene-CO-2, 2, 6, 6 Tetra Methyl-4-Piperidinyl Methacrylate)......Wu Shikang [0702 0013 1660], Dai Guangsong [2071 0342 2646] and Liu Lusheng [0491 7627 3932], all of the Institute of Photographic Chemistry, Chinese Academy of Sciences (234)

9717
CSO: 4008/429

PUBLICATIONS

TABLE OF CONTENTS OF 'DIWEN WULI' VOL 3 NO 2, 1981

Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese Vol 3 No 2, Jun 81 inside back cover

[Text] Ziman-type Theory for Electrical Resistivity of Crystalline Alloys and T^2 Dependence of Resistance in A15 Compounds......Lei Xiaolin [7191 0876 7207], Shanghai Institute of Metallurgy, Chinese Academy of Sciences (90)

Hollow Superconductors in a Steady Magnetic Field...... Xu Longdao [1776 7893 6670], Department of Physics, Nanjing University (98)

Study of Several Type II Superconductors' $4\pi M$-H Curves...... Ge Yingcai [5504 5391 2088], General Research Institute for Nonferrous Metals, Ministry of Metallurgical Industry (103)

Inelastic Electron Tunneling Spectroscopy (IETS)......Shen Huixian [3088 1979 6343], Institute of Physics, Chinese Academy of Sciences (112)

On the Accurate AC Loss Measurement for Superconducting Magnets at Low Frequency......Shao Huimin [6730 1920 3046], Department of Physics, Nanjing University (119)

Method of Designing Pulse Magnet Using Wire Known Cross Section Area......Li Yuzhi [2621 3769 5347], Department of Physics, University of Science and Technology of China (124)

On the Packing Factor of "Rutherford" Superconducting Cable ......Xu Shiming [1776 6108 7686], Shanghai Institute of Metallurgy, Chinese Academy of Sciences (131)

ZrO_2 Precipitation and Its Effect on the Superconductive Property of Nb_3Sn......Cheng Pengzhu [4453 7720 5053], Wang Guirong [3769 2710 5554] and Chen Guiyu [7115 2710 3768], et al., all of the Institute of Physics, Chinese Academy of Sciences (135)

Microstructure of Nb_3Sn with the Addition of Copper...... Jin Zuowen [6855 0155 2429], Guan Zhenhui [4619 2182 6540] and Lin Shuyuan [2651 3219 1254], et al., all of the Institute of Physics, Chinese Academy of Sciences (138)

Measurement of the Resistivity of Metal Samples by the Eddy Current Method......Ni Yongming [0242 3144 2494], Institute of Physics, Chinese Academy of Sciences (143)

An Apparatus for Levitation-melting......Liu Zhiyi [0491 1807 3015], Bi Wen [3968 2429] and Liu Zhenxing [0491 2182 5281], all of the Institute of Physics, Chinese Academy of Sciences (150)

Measuring Method of the Closed Cell Proportion of Insulating Plastic Foams for Liquid Hydrogen Tank......Zhu Xian [2612 6343], Dang Zheng [7825 7201] and Ji Yongfu [0370 0516 1133], et al., all of the Lanzhou Institute of Physics (156)

Temperature Variations of Specimens in Cryogenic Impact Testing......Zhang Chuntang [1728 2504 1016], Liu Shangyun [0491 0006 6663] and Song Shuguan [1345 2885 1351], et al., all of the Guangming Chemical Engineering Research Institute, Ministry of Chemical Industry (162)

A Rhodium-Iron-Resistor Thermometer at Lower Temperatures ......Xie Lizhong [6200 4539 1813] and Wu Zhenjiu [2976 2182 0036], both of the Guangming Research Institute of Chemical Engineering, Ministry of Chemical Industry (170)

9717
CSO: 4008/433

TABLE OF CONTENTS OF 'WULI XUEBAO' NO 6, 1981

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese No 6, Jun 81 inside back cover

[Text] Crystal Structure of Cerium Pentaphosphate...... Lin Yonghua [2651 3057 5478], Liu Shuzhen [0491 2579 3791], Hu Ninghai [5170 1380 3189] and Zhou Qinglian [0719 3237 1670], all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (714)

Calculation of SHG Coefficients of $NaNO_2$ Crystals by Using CNDO/S Method......Chen Chuangtian [7115 0482 1311] and Liu Zhiping [0491 1713 1627], both of the Fujian Institute of the Structure of Matter, Chinese Academy of Sciences; Shen Hesheng [3088 5440 3932], University of Science and Technology of China (721)

Poincaré Gauge Field of Gravitation and the Motion of Spin 1/2 Particle......Li Guangyi [2621 0342 0308], Suzhou University (730)

On the Isomorphism between Gauge Groups Before and After Renormalization in the Presence of Abel Subgroups and Higgs Fields......Wang Rong [3076 1369], Graduate School, University of Science and Technology of China (746)

Statistical Theory of Type I Antiferromagnetism and AB Alloy Superlattice on a Face-centered Cubic Lattice--A Series Expansion Method......Liu Zhiming [0491 1807 2494], Zhang Fuchun [1728 1381 2504] and Xu Wenlan [1776 2429 5695], all Graduate Students, Beijing Graduate School, University of Science and Technology of China; Li Yinyuan [2621 5593 6678], Institute of Physics, Chinese Academy of Sciences (760)

Theory of Inclusion and Applications to the Study of Fractures ......Zhang Hongtu [1728 1347 0956] and Zhe Xiaoli [2124 2556 7812], both of the Department of Physics, Lanzhou University (774)

The Adaptability of Ginzberg-Landau Theory for Superconducting Thin Films......Zhang Yuheng [1728 5940 1854], Department of Physics, University of Science and Technology of China (782)

An Analytic Derivation for the McMillan T_c Formula (I)--The Case of $\mu^* = 0$......Wu Hangsheng [0702 2635 3932], Mao Deqiang [5403 1795 1730] and Gu Yiming [7357 0001 7686], all of the University of Science and Technology of China (793)

A Proposal of Double Heterojunction Double Drift Region InP/InGaAsP/InP Avalanche Diode......Yang Yufen [2799 3768 5358], Institute of Semiconductors, Chinese Academy of Sciences (801)

TEM_{00}-Thermo-insensitive Cavity in the Presence of Several Thermo-perturbations......Zhang Guangyin [1728 0342 1377], Department of Physics, Nankai University (809)

A Bistable Liquid Crystal Electro-optic Modulator...... Zhang Hongjun [1728 3163 6874], Dai Jianhua [2071 1696 5478] and Yang Junhui [2799 0689 1979], et al., all of the Institute of Physics, Chinese Academy of Sciences (819)

Tuning of a Pulsed Dye Laser Using a Compound Cavity...... Xu Zuyan [6079 4371 1750], Pan Shaohua [3382 1421 5478] and Deng Daoqun [6772 6670 5028], et al., all of the Institute of Physics, Chinese Academy of Sciences (826)

Research Notes

Measurement of Spin Wave Linewidth......Han Shiying [7281 0013 3853], Department of Physics, Nanjing University (831)

Influence of Irradiation Damage on the Line Shapes of Mossbauer Spectra of α-Fe_2O_3......Du Youwei [6757 2589 3634], Hu Naixiong [5170 6621 7160] and Lu Huaixiang [7120 2037 0341], et al., all of the Department of Physics, Nanjing University (834)

Dynamic Process of $\beta \to \alpha$ Transition of $LiIO_3$ Crystals under Hydrostatic Pressure......Yao Yushu [1202 3768 2579], Chen Hong [7115 4767] and Xu Ji'an [1776 3444 1344], et al., all of the Institute of Physics, Chinese Academy of Sciences (840)

Color Restoration of Faded Color Films with White-light Processing......F.T.S. Yu, Department of Electrical Engineering, Pennsylvania State University; Mu Guoguang [3018 0948 0342], Visiting Scholar from the Department of Physics, Nankai University, Tianjin; Zhuang Songlin [5445 2646 2651], Visiting Scholar from Shanghai Institute of Optical Instrument Research (848)

Decomposition of the ε-phase Obtained by means of Splat Quenching in the Fe-C-Sb Alloy......Chen Xichen [7115 3356 3819], Yi Sunsheng [2496 1327 5110] and Wang Zulun [3769 4371 1510], all of the Institute of Physics, Chinese Academy of Sciences; Wu Dehai [0702 1795 3189], et al., all of Qinghua University (852)

The Heavy Atom Method of Multi-solution Type......Zheng Qitai [6774 0796 3141] and Shen Fuling [3088 4395 5376], both of the Institute of Biophysics, Chinese Academy of Sciences (856)

9717
CSO: 4008/431

PUBLICATIONS

TABLE OF CONTENTS OF 'QICHE JISHU' NO 7, 1981

Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 7, 25 Jul 81 p 1

[Text] Design and Research

Calculations of the Static Characteristic of Air Brake Valves......Shen Yanxing (2)

The Modification of the Jiefang Truck Engine (Part 2)--The Design of the Cam Profile with Trapezoidal Acceleration ......She Baoyu [0152 1405 6596], Shi Shuming [0670 2579 2494] and Niu Jinglin [3662 2529 2651], et al., all of Changchun Automotive Institute (13)

Study of the Heat Radiating Ability of Radiators...... Zhang Fenglin (22)

Technology and Materials

Far-infrared Drying and Painting......Wang Xichun [3769 6932 2504] and Hu Zhijia [5170 1807 1367], Both of Automotive Plant No 1 (29)

A Simple Two-side Method for Cutting Quasi-hypoid Gears without Cutter Inclination Occurring......Zou Qinzhang (33)

Improvement of the Design of the Copy as Used to Process the Eccentric Camshaft......Zhou Yinhan (43)

Study and Application of Vermicular Graphite Iron Treated by Rare Earth Magnesium and Titanium (Part 2)......Chen Xiudi, et al. (44)

Maintenance and Service

Front-wheel Clutch--A Device Saving Energy for BJ-212 Jeep ......Zhao Yinwu [6392 5593 0582], Beijing Automotive Research Institute (50)

Welding for Motor Parts Made of Malleable Cast Iron......
Zheng Zhangrun (53)

Causes and Protection of the Cavitation Erosion in HINO EB 300 Diesel Cylinder Liner......You Zhiguo [3266 3122 0948], Science and Technology Office, Tianjin Transportation and Communication Bureau (55)

Design Series

Selection of the Type and Design of an Automobile Trailer (Part VII)......Chen Chuanxin and Zhang Xiuzhi (61)

Question and Answer...... (64)

9717
CSO: 4008/454

AUTHOR: SHI Shisheng [2457 1102 0581]

ORG: Department of Civil Engineering, Qinghua University

TITLE: "Test and Plastic Analysis of Two-way Prestressed and Corner-supported Ribbed Slabs"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 2-12

TEXT OF ENGLISH ABSTRACT: The practical engineering of an experimental building of ribbed ceramsite concrete slab with filled hollows, which is two-way pressed and corner-supported, is studied in relation to plastic theory analysis in which the plates and ribs of the slab are taken for joint action in resisting bending, twisting moment and shearing force in the finite difference method program according to the elastic theory of plates. Plastic analysis of the above-mentioned structure system has been done very rarely so far. Based on the test and analysis, failure patterns of the slab are reported in this paper. It is found that the theoretical calculations by plastic theory agree with the test values, which will lead to a more reasonable and simplified way of calculation in practice. In addition, a comparison is made between yielding-line method and strip method analyses for the tested slab, which indicates that the latter is safer than the former.

AUTHOR: JIN Xueyi [6855 1331 2496]

ORG: Southwest Jiaotong University

TITLE: "Calculation of Railway Tunnel Non-curtained Ventilation"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 13-22

TEXT OF ENGLISH ABSTRACT: A study of blowing-in ventilation in a railway tunnel with no portal curtain device is presented and justified in this paper by model test data. Taking into consideration the skin friction at the intersection of the tunnel and the air duct, the calculation is formulated based on the momentum equation for evaluation of the air flow ratio of the tunnel proper to the air duct. Aided by the model test, the effect of the local vortices at the tee section is investigated, and it is believed that the method of determining the air flow ratio by the momentum equation is applicable to the location of the inlet not only near the tunnel portal, but anywhere else as well.

In addition, an investigation is also made on the ventilation efficiency and rational cross sectional area of the inlet according to the static pressure and the minor loss factor at the inlet of the test model.

AUTHOR: WANG Yisun [3769 6318 5549]
WANG Kecheng [3769 0668 2052]
HE Taiqiong [6320 0669 8825]

ORG: WANG Yisun of Hunan University; WANG Kecheng and HE both of the Hunan Computing Center

TITLE: "Vertical Vibration Analyses of Rectangular Foundation"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 23-34

TEXT OF ENGLISH ABSTRACT: The exact solution of the center displacement of a circle under uniformly distributed harmonic load on an elastic halfspace of arbitrary Poisson's ratio is given in this paper. The formulas for both the vertical displacement of the points outside and inside the base of a rectangular foundation and the average displacement of the foundation are presented. The results obtained from the relevant formulas are shown by charts and numerical tables, and are compared with those from other existing methods to verify the validity of the method presented in this paper. Finally, the determination of the parameters related to the lumped mass-spring-dashpot analog for rectangular foundation vibration is also discussed in brief.

AUTHOR: YIN Wanshou [3009 8001 1108]
ZHAO Suizhang [6392 3606 4545]
LIN Yinyue [2651 5593 1471]

ORG: All of the Large Bridge Engineering Bureau, Ministry of Railways

TITLE: "The Oscillation of Deep Water Floating Caissons during Construction"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 35-40

TEXT OF ENGLISH ABSTRACT: During the construction of the two floating caissons of a bridge across the Changjiang River in China, an abnormal late autumn flood damaged the side anchoring cable system and set the floating system in a dangerous lateral oscillation. This paper presents a detailed description of the fault, the cause of the oscillation, and the method of restoring the system control, as well as some related discussions.

AUTHOR: FAN Lichu [5400 4539 4342]

ORG: Tongji University

TITLE: "Nonlinear Earthquake Response Analysis of Beam Bridge"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 41-52

TEXT OF ENGLISH ABSTRACT: According to the analytical results of a field dynamics test of the new Luan River bridge, the simplified mechanical model for calculating the earthquake response of the beam bridge structure is established with lumped masses and an equivalent soil-spring system. This system is modeled after the resisting force of soil layers under the ground.. Taking into account the β parameters (from the Newmark-β method) and θ (from the Wilson-θ method), an improved numerical analysis procedure is derived in this paper, and a complete program is thus developed.

A sketch of the old Luan River bridge structure after the earthquake disaster is given, and the break mechanism of this structure and some related problems in the analysis are also discussed.

AUTHOR: SHI Yanwen [0670 1750 2429]

ORG: Northwest Water Conservancy Research Institute, Ministry of Water Conservancy

TITLE: "A Study of Maximum Density of Large-sized Sandy Gravels"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 53-58

TEXT OF ENGLISH ABSTRACT: The author has deduced an ideal linear equation relating the maximum density of sandy gravels under vibration to the similar gradation modulus, and has extrapolated the maximum density of large-sized prototype sandy gravels. The deduced maximum density of the sandy gravels has been compared with the results of field measurements. Thus, on overcoming the difficulty in test techniques of large-sized materials, a new method of determining the optimum density of coarse-grained embankment materials is introduced which provides a scientific basis for analyzing the stability of high earth rock-filled dams.

AUTHOR: XIONG Dunshi [3574 2415 1102]
WANG Taijun [3076 3141 6874]
HE Shuyan [0149 2885 1693]
HE Kanghui [0149 1660 1920]

ORG: All of the Nuclear Energy Technology Research Institute, Qinghua University

TITLE: "Elastic Analysis of Prestressed Concrete Pressure Vessels by Three-dimensional Isoparametric Finite Element Method"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 59-69

TEXT OF ENGLISH ABSTRACT: Taking into consideration the effect of the liner, reinforcing bar and prestressed reinforcement, the elastic solution of PCPV's by the isoparametric finite element method is discussed in this paper. Requirements for shape function to meet convergence criteria and isoparametric transformation are studied together with the general method for establishing the shape function of different elements. Formulas are derived in respect to the contribution of the effect of the liner and reinforcement to the stiffness matrix of a three-dimensional body element. Peculiarities of the computer program, CHFEM, for the analysis of the three-dimensional isoparametric element are briefly described. Finally, through practical example, a comparison is made between the calculated values and those measured.

AUTHOR: ZHANG Shiduo [1728 1102 6995]

ORG: Tongji University

TITLE: "On the Calculation of Cracking of Reinforced Concrete Beams under Long-term and Repeated Loadings"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 70-82

TEXT OF ENGLISH ABSTRACT: Many semi-theoretical and experimental expressions are now available for computing the crack interval and its maximum opening on reinforced concrete beams under short-term loadings. After summarizing the cracks and their origins, the author tries to discuss some points concerning the crack expressions listed in China's current specifications on highway bridges. Based on the above discussion, the author proposes expressions for evaluation of crack width and beam intervals under long-term and repeated loadings in which the four parameters are analyzed and estimated according to available experimental data from various researchers. Finally, the test data from British, Chinese and Soviet researchers and 12 years of site observations from Yongjiang bridge, Guangxi Autonomous Region, are used to examine the proposed crack formulas for practicality.

AUTHOR: MEI Yaokun [2734 1031 0981]

ORG: Guangdong Academy of Architectural Design

TITLE: "Analysis of Temperature Stresses in Circular Concrete Arches"

SOURCE: Beijing TUMU GONGCHENG XUEBAO [CHINA CIVIL ENGINEERING JOURNAL] in Chinese No 2, 1981 pp 83-97

TEXT OF ENGLISH ABSTRACT: In the structural mechanics method currently used for analysis of temperature stresses in circular concrete arch bridges, certain factors affecting these stresses are neglected for the sake of simplification of calculation, and, therefore, the outcome is approximate and generally the error may exceed the allowable limit. Furthermore, the method is limited in application for cases of constant temperature field.

Based on the theory of elasticity, a set of fundamental differential equations are formulated in this paper to solve the temperature stresses and deformations of circular arches under conditions of constant and variable temperature fields respectively. When compared with the results obtained by the current method, the method presented here offers wider applicability and better accuracy, and, in addition, the formulas are rather simple.

9717
CSO: 4009/407

AUTHOR: XU Guozong [7312 0948 1350]

ORG: Shanghai Research Institute of Metallurgy

TITLE: "Characteristics and Application of EPROM Made in China"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 8, 81 pp 15-18

ABSTRACT: EPROM [Erasable Programmable Read-Only Memory] is a type of PROM that is capable of being electrically reprogrammed repeatedly. With the development of microcomputers, EPROM has a wide range of applications. China has now successfully made 2 types of 2K and 8K EPROM; they are now officially in production. They have the following characteristics: (1) A special input device using the form of electrical pulses is used to reprogram; (2) The data thus written into the EPROM may be preserved for many years; (3) Irradiation with ultraviolet light is all that is needed to revise [erase] the contents of the EPROM; (4) The TTL circuit is convenient for both output and input; (5) The multi-digit output structure has a storage capacity of W x 8 places; (6) The address access time is less than 450ns. The basic theory of information storage, characteristics of the 2K EPROM and the 8K EPROM, the method of erasing the information, the structure of the program input device, and some major applications of the 2 types of EPROM are introduced.

AUTHOR: HUANG Shizhong [7806 6624 0022]
YIN Guangji [3009 1684 3444]

ORG: None

TITLE: "Establishment of a Joint Computer Software Center Ratified by Both Governments of China and Japan"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 8, 81 p 48

ABSTRACT: The China Computer Technology Service Company, which is a part of the State's Bureau of Electronic Computer Industry reached an agreement and signed a formal contract with the NEC Company of Japan to establish, jointly, a Sino-Japanese Computer Software Center in Beijing, which will involve technical cooperation of the two countries in the realm of computer science. This cooperation will have a positive effect in promoting the development of softwares in China. The negotiation was prompted by QIAN MIN 6929 2404] the Minister of the Fourth Ministry of Machines and XIAO-LIN Hongzhi [transliteration] head of the NEC Company of Japan under the spirit of mutual cooperation. The proposed center will be managed by a committee, composed of 6 representatives, three from each country. The software center will train Chinese personnel for business management, systems engineering, programming, computer application extension, development and application of softwares, etc. and will also serve as a center of user service and training as well as equipment maintenance. The cooperative establishment of this center has aroused attention and interest among related circles here and abroad. It is certain that the center will contribute to the development of friendship and science and technology of both countries.

AUTHOR: JIAO Zhongyi [3542 0112 0034]

ORG: None

TITLE: "The Production Line of Flyback Transformer Imported by Beijing Television Component Plant No 3 Has Begun to Operate"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 8, 81 p 48

ABSTRACT: For the development of a television industry and under the unified arrangement of the State's Planning Committee, the Beijing Television Component Plant No 3 imported from the Shengli [Sony] Company of Japan the equipment for producing the flyback transformer [horizontal output transformer] used in color television. The equipment has a design capacity of producing 500,000 such transformers a year. The contract for this equipment was signed in Dec 79. The coordinating accessories began to be designed in China in Mar 80. The equipment and all related installation were completed in Dec 80. On 1 Feb 81, the test operation began. The rate of qualified products was calculated to be 97.7 percent. Under the condition of an environmental temperature of 45°C and a relative humidity of 95 percent, the equipment operated continuously without interruption for half a month while sample products were being taken. The operation was found to be normal. The safety characteristics were found to meet UL and CSA standards. The technical properties of the products were rated first in China and were found to possess the condition to enter international markets. A ribbon cutting cerenoney was performed to mark the official opening of the Plant on 15 Apr 81.

6248
CSO: 4009/466

Geography

AUTHOR: WANG Nailiang [3769 0035 2733]
YANG Jingchun [2799 2529 2504]

ORG: Both of the Department of Geography, Beijing University

TITLE: "Neotectonics Study in China--Review and Prospects"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 135-142

TEXT OF ENGLISH ABSTRACT: Neotectonic movements are very active in China, but before liberation they were only occasionally noticed by scholars. It was only after liberation, when the study of neotectonics was integrated with construction works, that it progressed quickly. The chief achievements in this field of study are as follows: 1) Research on relations between neotectonics and the evolution of landforms; 2) Investigations of active faults and folds; 3) Inquiry into the relations between neotectonics and deep-seated structures in the earth's crust; 4) Research on the stress field of neotectonics; 5) Study of the relations between neotectonics and earthquakes; 6) Application of new techniques and methods to the study of neotectonics.

Hereafter the study of neotectonics in China will have the following trends: 1) The study will proceed from the shallower part of the earth's crust to the deeper part, resulting in better elucidating the neotectonic phenomena and the origin of mega-structural landforms; 2) The study will extend from Plio-Pleistocene

[Continuation of DILI XUEBAO No 2, 1981 pp 135-142]

to Holocene time spans; 3) The application of new techniques and methods will be much enhanced, so as to transform the nature of study from qualitative to quantitative; 4) More attention will be paid to the study of horizontal movements in addition to vertical movements; 5) A more widespread monitoring of active faults will be undertaken, which will lead to prediction of future fault activities; 6) The study of the history of neotectonic movements will also be enhanced; 7) A more comprehensive study of the Quaternary tectonic stress field will be launched.

AUTHOR: QIAN Ning [6929 1380]
ZHANG Ren [1728 0088]
LI Jiufa [2621 0046 7569]
HU Weide [5170 4850 1795]

ORG: QIAN and ZHANG both of the Department of Hydraulic Engineering, Qinghua University; LI of the Estuarine and Coastal Research Institute, Huadong Normal University; HU of the Fifth Bureau of Construction, Ministry of Water Conservancy

TITLE: "A Preliminary Study of the Mechanism of Self Regulation of Sediment Transport Capacity in the Lower Huanghe (Yellow River)"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 143-156

TEXT OF ENGLISH ABSTRACT: In rivers with heavy sediment load, the river channel will adjust itself temporarily in accordance with the variations in sediment concentration and composition for each flood. When the amount of sediment coming from upstream increased, the result of self adjustment is in the direction of increasing the sediment transport capacity such that the outgoing load from the reach will also be increased. This is the so-called "the more it comes, the more it goes," which is well known in the Lower Huanghe.

In this article the modified Einstein Bed-load Function is used as a tool for studying the mechanism of short-period adjustment in rivers with high concentrations.

[Continuation of DILI XUEBAO No 2, 1981 pp 143-156]

The results of analysis indicate that for the Hua-Yuan-Kou reach of the Lower Huanghe, the channel bed is usually silted up for a high oncoming load, yet the concentration is smaller than 400 kg per m^3. As a consequence, the bed composition will become finer, and it is essentially through this process that the sediment transport capacity is raised. However, when the oncoming load surpasses 400 kg per m^3, the channel will instead be deeply eroded. In this case, the change in physical properties of the flow due to the presence of high sediment concentration and the adjustment in channel shape are the two major factors in raising the sediment transport capacity.

AUTHOR: ZHANG Wenchang [1728 2429 0863]

ORG: Institute of Geography, Chinese Academy of Sciences

TITLE: "Some Problems in the Allocation of Transport in Industrial Bases"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 157-170

TEXT OF ENGLISH ABSTRACT: Because of their various conditions and specializations, different kinds of industrial bases have different types of inter-regional and intra-regional economic links and thus have different requirements for a transport network.

The author analyzes four kinds of industrial bases:
(1) Inter-regional raw material or fuel base. It is characterized by the much larger tonnage of exports than imports, e.g., Shanxi coal base, with coal tonnage making up 80 percent of the provincial freight of the railroad, and export tonnage three times more than import tonnage.
(2) Industrial base with developed manufacturing industries depending on supply of raw materials and fuels from outside, e.g., Shanghai, with import tonnage twice as much as export tonnage.
(3) Complex industrial base depending on local resources. Its import, export and intra-regional tonnage is usually large, e.g., Liaoning Province. Its railroad freight accounts for 13 percent of that of all of China, with more than 70 percent

[Continuation of DILI XUEBAO No 2, 1981 pp 157-170]

of it being intra-regional.
(4) Industrial base with mainly intra-regional links, e.g., Sichuan Province. Because of its particular geographical conditions, Sichuan has weak economic links with the outside, and nearly 90 percent of its total freight is intra-regional.

With the development of the industrial base, its orientation and characteristics of economic links are always changing. For example, Liaoning Province has experienced three stages, i.e., 1) largely exporting raw materials and fuels, 2) developing primary industries dependent on local resources, 3) necessarily importing considerable amounts of raw materials and fuels. In all these stages, allocation of transportation lines has been required to develop accordingly.

Any large industrial base needs construction of a transport network. Through analysis of case studies in China, the author argues that the distance of trunk lines (railroad and river) should be no less than 120 km.

The author gives several examples to explain that transport construction (including lines, stations, ports, etc.) must be undertaken in advance of the regional development and construction of industrial bases.

AUTHOR: LI Shoushen [2621 1108 3234]

ORG: Department of Geography, Beijing University

TITLE: "Some Problems Related to Mapping the Land Types in the Mountainous Region (Based on Studies of the Mountainous Region West of Beijing"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 171-179

TEXT OF ENGLISH ABSTRACT: The procedure of mapping the land types in mountainous regions is quite different from that in the plains. In mountainous regions, mapping needs to begin with studying the basic morphological features of the mountains. These include the vertical zonation, alternation of positive and negative landforms, aspects of slopes, etc. In addition, the formation of the morphological features of land units should also be analyzed.

While making large- and middle-scale maps of the land types of the mountainous region west of Beijing, two facts have been noticed. One fact is that the latitudinal position and altitude of the mountain determine the spectrum of vertical zones and its structure. The other is that the geological and geomorphological factors (geological structure, new tectonic movement, lithology, types of landforms, etc.) have important relationships to the differentiation of the land units and their structural characteristics. They also form the basis for different agricultural uses. Therefore, these two facts have to be studied carefully in order to

[Continuation of DILI XUEBAO No 2, 1981 pp 171-179]

give a sound foundation to mapping.

Several related problems should be studied further. They are:
1. The hierarchy of the classification of land units. We think that the hierarchy should be "the vertical zones of mountain landscape, land system, facet and elements." Such a hierarchy not only agrees with the characteristics of the mountainous region, but also is useful in making comparisons with the land types of the plains.
2. The basic contents of maps of different scales. Considering the characteristics of the mountainous region and the present agricultural land use conditions, we suggest that: (1) for large-scale mapping, the land facet should be the main object; (2) for middle-scale mapping, the land system should be the main object; and (3) for small-scale mapping, the vertical zone of natural landscape should be the main object. As for the land elements, it does not seem feasible to map these.
3. Legend design and nomenclature. Legend design and nomenclature should reflect the comprehensive character of the land. Both the sequent legend and the two-row or multi-row index legend can be used. Each has its advantages and shortcomings. However, in compiling the land type maps of the whole country, it is convenient to use the sequent legend.
4. The synthesis of the land type maps. We have attempted to synthesize the land type maps according to the regional principle and the type principle. This involves the shape and boundary of the mapping units, the unification and adjustment of the legend symbols, etc. All these problems need to be studied further.

AUTHOR: WANG Mingyuan [3769 2494 6678]
ZHANG Shen [4545 3747]

ORG: Both of the Department of Chemical Geography, Institute of Geography, Chinese Academy of Sciences

TITLE: "Characteristics of Chemical Geography in Regions of Kaschin-Beck's Disease"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 180-186

TEXT OF ENGLISH ABSTRACT: Kaschin-Beck's disease is a non-communicable endemic that is distributed widely in China. This study indicates that the chemical geography in the disease-occurring regions is characterized by a lower content of sulfur and selenium and a high content of strontium in the drinking water, soil and grain as compared with healthy regions. The geographical epidemicity of this disease may be controlled by a high content of sulfur and selenium in the environment. This disease can also be prevented and cured to a certain extent by chemical compounds containing sulfur. As the cause of this disease is not yet completely known, the relationship between this disease and some trace elements related to sulfur in the field of biogeochemistry should be further studied.

AUTHOR: GUO Qiyun [6753 0366 5619]
WANG Jiqin [3769 4949 3830]

ORG: Both of the Institute of Geography, Chinese Academy of Sciences

TITLE: "Interannual Variations of Rain Spell during Predominant Summer Monsoon over China for the Past 30 Years"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 187-195

TEXT OF ENGLISH ABSTRACT: 1) By using the normal decade rainfall data for eastern China an analysis of the seasonal change of rainfall is made. The investigation shows that the maximum rainfall zone usually stagnates for some days in south China when moving from south to north, doing so in the Changjiang Basin and north China also. These three periods of stagnation coincide roughly with the time interval of the predominant monsoon in the above-mentioned regions. However, in the Changjiang Basin the length of the stagnating period was much shorter than that of the other two regions, with a slight movement of the maximum rainfall zone observed.

2) The rain spells for south China, the Changjiang Basin and north China were determined by using the pentad rainfall data year by year from 1951 to 1979. The beginning and ending dates, intermissions and persistence of the rain spells were obtained. The rainfall total for each rain spell was also calculated. It is found that the characteristics of rain spells varied obviously from one year to

[Continuation of DILI XUEBAO No 2, 1981 pp 187-195]

another. The beginning dates of rain spells experienced the biggest interannual variations, especially in south China. The variations of rain spells of one region rarely correlated with those of another.

3) An analysis of long period rain spell variations shows that the trend was more predominant in the Changjiang Basin. In general, the beginning of the rain spell was earlier, the duration was longer and the total rainfall was more in the 1950's in the Changjiang Basin and south China. On the other hand, the beginning of the rain spell was later, its length shorter, and the total rainfall was smaller in the Changjiang Basin in the 1960's. At the same time, the beginning of the rain spell was earlier and it persisted longer, although the total rainfall did not increase much, in north China. In the 1970's, in both south and north China the rain spells started later and also ended later. In the last decade the total rainfall at the Changjiang Basin has been between those of the 1950's and 1960's.

AUTHOR: CUI Qiwu [1508 0796 2976]
ZHU Jinwei [2612 0513 0251]

ORG: Both of the Institute of Forestry and Pedology, Chinese Academy of Sciences

TITLE: "The Transmissive and Reflective Theoretics of Light for Various Structures of the Forest Canopy"

SOURCE: Beijing DILI XUEBAO [ACTA GEOGRAPHICA SINICA] in Chinese No 2, 1981 pp 196-208

EXCERPTS FROM ENGLISH ABSTRACT: In this paper the theoretical distributions of direct and diffuse light in the forest canopy are described. The relative light under the forest canopy is calculated as a function of the leaf area index, sun elevation and characteristic angle of the leaves. Light reflections in the forest canopy are computed in a system with horizontal leaves and vertical leaves. The results obtained are discussed.

9717
CSO: 4009/397

AUTHOR: LIN Zhiguang [2651 0037 0342]

ORG: None

TITLE: "Characteristics of Rainstorm Weather in China"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 7, Jul 81 pp 4-6

ABSTRACT: On 5-7 Aug 1975, a heavy rainstorm occurred in the hilly region of the upper reaches of Huaihe in central south Henan Province. A total of 1603 mm of rain fell in the period of 3 days over some counties, such as Linzhuang and in an overall area of 19,410 km^2, the rainfall of the 3 days exceeded 400 mm everywhere. Historically, a similar rainstorm is reported in records of local counties in 1593, amounting to once in 400 years. Rainstorms of such a magnitude occurring in Hebei (1963) Shaanxi (1977) the Yangzi Valley (1931, 1954, 1980) and Taiwan (1963, 1967) are briefly described. Due to the fact that rainstorms need vapor which in China is almost always supplied by the low latitude sea of the south, generally speaking there are more rainstorms in South China than North China, more along the coastal region than the inland areas. Rainstorms in China also have the characteristic of being concentrated in the summer monsoon season. Finally, the paper analyzes the relationship between rainstorms and topography. As a rule; therefore, they are rare in the arid Northwest and Qinghai-Xizang Plateau because of the relatively low humidity and minimal vapor supply in these regions.

AUTHOR: LI Changwen [2621 2490 2429]

ORG: None

TITLE: "Will the Region of the Vicinity of the Tropic of Cancer in China Turn Into a Desert?"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 7, Jul 81 pp 8-9

ABSTRACT: It has been claimed by some that due to the destruction of forests in Xishuangbanna of Yunnan Province, which is located in the "Tropic desert zone" the region will turn into a desert in 7-8 years, or no more than several decades. Some rather famous scientists went so far as to claim that the Dinghushan monsoon evergreen forest will become an oasis, locating exactly on the eastern end of this desert zone. The author argues against this viewpoint. In his opinion, although many famous deserts of the world are distributed in the vicinity of the Tropic of Cancer or the Tropic of Capricorn, aridity and lack of rainfall remain the necessary condition for desert formation. The special natural geographic condition of the region of the Tropic of Cancer in China, influenced primarily by the Qinghai-Xizang Plateau and the nearby oceans, provides it with a climate different from other regions of the same latitude in other countries; therefore, there is no worry of its turning into a desert. The harmonious water and heat relationship and abundance of rainfall in that region of China provide the destroyed forests a sufficiently high natural ability of renewal and rate of growth for fast recovery. After the policy of cropping

[continuation of DILI ZHISHI No 7, 1981 pp 8-9]

discontinuance was implemented in 1964 in Yunnan, the artificially seeded and naturally renewed forests have grown larger every year. At present, the destroyed and barren mountains have reached 80 percent of vegetative coverage. In Baisha County of Hainan Island, the forests that were selectively logged in 1970-71 have all grown back. Trees of some dominant species now measure about 107 cm in diameter.

6248
CSO: 4009/467

AUTHOR: HONG Yuanzhang

ORG: Yongkang Tractor Factory

TITLE: "Investigation of the 10,000 Hour Endurance Test for the Crankshaft of Model S195 Diesel Engine"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 1-8

TEXT OF ENGLISH ABSTRACT: In this paper, the results of a 10,000 hour endurance test for the nitempered crankshaft of model S195 diesel engine are described. The results show that both the outside compound layer and the inside nitrided diffusion zone possess good wearability. Therefore, in order to prolong the service life of the nitempered crankshaft, not only the surface condition of the thinner compound layer but also the property of a thicker nitrided diffusion zone with higher concentration of nitrogen should be studied.

AUTHOR: SHEN Li [3947 3810]
LI Fenlun [2621 5358 0243]

ORG: Both of Qinghua University

TITLE: "Study of the Measuring Equipment for Bosch Injection Rate"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 9-15

TEXT OF ENGLISH ABSTRACT: Measuring equipment with no back pressure for the Bosch injection rate has been designed and operated. The reliability of its results has also been investigated.

After studying the correlation of the injection rate, fuel pressure in the pipe and the needle valve lift and analyzing the amplitude of the first reflecting wave, we are ready to compare the results obtained by this equipment with those obtained by the rotating cells method and the ordinary Bosch method.

In this paper, the proposed criterion for the design of measuring equipment for the Bosch injection rate is that under the condition of no back pressure, the orifice chosen should be small enough to make the amplitude of the first reflecting wave slightly greater than that of the original one (or four waves present in the oscillogram).

AUTHOR: YUN Zhang'an [1926 3864 1344]

ORG: Zhenjiang Institute of Agricultural Machinery

TITLE: "Discussion of Thermal Load Analysis in the Cylinder Head of a Diesel Engine"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 16-21

TEXT OF ENGLISH ABSTRACT: Through temperature measurement it is found that the maximum thermal load is in the bridge zone between valve seats of the cylinder head. On this basis, the traditional viewpoint of analyzing the heat transfer of water cooling surfaces by the single-phase convection method may be discarded, while the mechanism of boiling heat transfer for analyzing the cooling effect of the cylinder head in a diesel engine is recommended emphatically in this paper. The cause of the thermal crack of the "bridge" is found to be scale formation and insufficient flow of cooling water, which is verified by the practical running of an engine.

AUTHOR: HU Xuefan [5170 7185 1581]
YAO Shulin [1202 3219 2651]
LIU Zhibang [0491 3112 6721]

ORG: All of the Shanghai Marine Diesel Engine Research Institute

TITLE: "An Investigation of the Turbocharging System with a Pulse Converter"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 22-30

TEXT OF ENGLISH ABSTRACT: This paper presents the calculating method of a pulse converter. In case of a lack of experimental data, the effect of the pulse converter on pressure waves in the exhaust manifold may be analyzed by means of the physical model and calculating method as described.

In addition, some problems concerning the performance of the pulse converter in a turbocharging system are briefly discussed. As far as turbocharged model 8300 diesel engine is concerned, it is found that the calculating results agree well with the pressure wave patterns and the data obtained by measurement.

AUTHOR: WENG Like [5040 4539 0344]

ORG: Shanghai Diesel Engine Works

TITLE: "Design Method of the Function Cam Profile Used in an Injection Pump"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 31-44

TEXT OF ENGLISH ABSTRACT: Through analyzing the movement of a cam-roller mechanism, this paper illustrates the design method of effective injection and descending sectors on the function cam of an injection pump and, in addition, the design method of a circular arc cam as well as the criterion for selecting basic parameters of both types of cam are also described. The function cam designed by the method mentioned in this paper has been used satisfactorily.

AUTHOR: SHI Huilan [2457 5610 5695]

ORG: Dalian Diesel Locomotive Research Institute

TITLE: "Design of the Parabolic Profile Compressor Inducer of a Turbocharger and Calculation of Its Coordinates Used in Machining by a Numerical Control Miller"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 45-54

TEXT OF ENGLISH ABSTRACT: This paper presents the calculating equations for designing a turbocharger compressor inducer with parabolic profile of arbitrary exponent, and the method of calculation by an electronic computer of its four-dimensional coordinates used in machining by a numerical control miller according to the loci of the cutter.

Due to the actual profile of the inducer machined being in disagreement with the designing requirement, the machining method of the inducer by a five-dimensional numerical control miller is to be investigated.

AUTHOR: SHEN Zujing [3088 4371 0079]

ORG: Qinghua University

TITLE: "The Data Processing and Comparability of Steady Air Flow Tests in Inlet Ports of an IC Engine"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 55-63

TEXT OF ENGLISH ABSTRACT: The flow parameters within the cylinder and at the inlet port are measured in steady air flow tests of an IC engine. The data processing and comparability of the tests have been investigated for the following two aspects:
1. Based on the theory of similarity, the air flow characteristics expressed by several non-dimensional parameters are analyzed and generalized.
2. Referring to the experimental results, the air swirl measurement by a vane meter, which represents as accurately as possible the practical angular momentum flux, is to be discussed.

Finally, the standard equipment and data processing method are proposed to facilitate comparison of the data of engine inlet port tests.

AUTHOR: HUANG Zhigang [7806 5267 0474]
YANG Renfa [2799 0088 4099]
ZHOU Weixin [0719 4850 2450]
QIU Genmao [6726 2704 5399]
et al.

ORG: All of the Shanghai Internal Combustion Engine Research Institute

TITLE: "Discussion of Light-duty Biogas-Diesel Dual Fuel Engine"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 64-70

TEXT OF ENGLISH ABSTRACT: Biogas is a kind of energy resource which has been comprehensively utilized in rural China due to its cheapness and availability. It is used in engines to save liquid fuel and to economically provide power and electricity in agriculture.

In this paper, the modification and operation principles of model S195 biogas engine and its governing mechanism are discussed. Together with some experimental results, these may be used as reference material in the work of converting diesel engines into dual fuel versions.

AUTHOR: LIN Gen [2651 0065]

ORG: Shanghai Internal Combustion Engine Research Institute

TITLE: "Development of Model CDX Digital Display Device for Hydraulic Dynamometer"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 71-77

TEXT OF ENGLISH ABSTRACT: The model CDX digital display device is an application of digital encoding and decoding techniques which converts the readings of a hydraulic dynamometer accurately into the digital display, providing not only the power indicator for the console, but also the signals which are necessary for load feedback and data processing in automatization of engine testing.

AUTHOR: XIANG Songnian [7309 2646 1628]

ORG: China Spring Factory

TITLE: "High Frequency Fatigue Machine for Valve Spring of Internal Combustion Engine"

SOURCE: Shanghai NEIRANJI GONGCHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 2, 1981 pp 78-83

TEXT OF ENGLISH ABSTRACT: In this paper, the construction and principle of a resonant type spring fatigue machine are so described that its design criterion can be derived. In addition, the working principle of its electric driving circuit is summarized.

9717
CSO: 4009/406

AUTHOR: LI Yangguo [2621 2254 0948]
LIU Yuan [0491 3220]
CHEN Shengzhong [7115 3932 1813]

ORG: All of the Institute of High Energy Physics, Chinese Academy of Sciences

TITLE: "High Energy α-α Elastic Scattering"

SOURCE: Beijing YUANZI HEWULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 3 No 3, Aug 81 pp 213-216, 206

TEXT OF ENGLISH ABSTRACT: Since the α particle has no spin and its isospin is equal to zero, the study of α - α elastic scattering at high energy might play an important role in the research on nucleus-nucleus collision. In this paper, based on two different approximations (the rigid projectile approximation and the optical limit approximation), the amplitudes for high energy α - α elastic scattering are given with an explicit feature of making numerical calculation easily. In detail calculation, the modified mass center correction is adopted for the optical limit case. The calculated results for both approximations agree with the experiment as well as the exact ones do.

AUTHOR: TAO Zhenlan [7118 2182 5695]
ZHU Fuying [2612 4395 5391]
QIU Huiyuan [5941 1920 3293]
et al.

ORG: All of the Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "The Excitation Functions for the Reaction $^{182-186}$W(d, 2n)$^{182-186}$Re and ^{186}W(d, p)^{187}W"

SOURCE: Beijing YUANZI HEWULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 3 No 3, Aug 81 pp 242-248, 241

TEXT OF ENGLISH ABSTRACT: By means of the high-resolution Ge(Li) γ-ray detector and on-line γ spectrum analysis technology, the excitation functions for the reactions $^{182-186}$W(d, 2n)$^{182-186}$Re, ^{186}W(d, p)^{187}W were measured for deuteron energies from about 7 to 15.7 MeV with natural tungsten. The data were compared with the calculations of the compound nuclear evaporation theory.

AUTHOR: FANG Jinqing [2455 6930 3237]

ORG: Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "Numerical Simulation of the Ion Optics of Intense Current Ion Beams Extracted from a Plasma"

SOURCE: Beijing YUANZI HEWULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 3 No 3, Aug 81 pp 267-277, 260

TEXT OF ENGLISH ABSTRACT: At the present time the ion optics of intense current ion beams is of particular interest to many fields of modern science and technology. In this paper, we have studied extraction of the intense current ion beams from a plasma in the calutron ion source and the subsequent acceleration of these beams by means of a combination of electrostatic and magnetic fields. This problem requires the simultaneous solution of: (1) the nonlinear Poisson's equation; (2) the non-relativistic equation of motion of ions; (3) the continuity of ion current.

In this paper we present a physical model and a convergent two-dimensional numerical method of simulation by a digital electron computer for planar axisymmetric ion beams in the calutron ion source. The physical model is based on the theory of the plasma-sheath which could provide a simple physical picture and can be used to calculate physical properties of the plasma emitter. The computer program is

[Continuation of YUANZI HEWULI Vol 3 No 3, Aug 81 pp 267-277, 260]

developed. The iteration scheme includes three iteration loops. It starts with the ions on the plasma emitter (i.e., the equi-potential surface in the plasma) and includes space charge of electron from the plasma which penetrates this emitter. The program can select the self-consistent shape and position of the plasma emitter, and can calculate space potential distribution, ion trajectories and distribution of space charge density.

Finally, some ion optical results of the calutron ion source are given, and are compared with the results of experiments. However, the method is not limited to the calutron ion source. The program is shown to provide a stable solution, and therefore should be useful for many situations. We are still continuing to study a variety of problems of ion optics of intense current ion beams.

9717
CSO: 4009/459

AUTHOR: ZHANG Wanxuan [1728 8001 6693]

ORG: East China Petroleum College

TITLE: "On Classification of Petroleum Pools and the Types of Petroleum Pools in China"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 1-11

TEXT OF ENGLISH ABSTRACT: A sound classification of petroleum pools must be scientific and practical: scientific in the sense that the classification is based on the trap forming elements and can reflect the differences and relationship between the traps, and practical in the sense that the classification is simple and clear enough to serve as a guide for oil and gas exploration.

Based on the above two criteria, the author proposes to divide the petroleum traps broadly into two basic types: structural and stratigraphic. Based on their specific origin and apparent features, structural pools are further classified into four sub-groups: anticlinal pools and pools caused by faulting, fracturing and piercement folding. Stratigraphic pools are subdivided into lithologic, stratigraphic nonconformity, stratigraphic overlap and bioherm pools.

The main types of oil pools in China are examined in the examples and also in the conclusion.

AUTHOR: XIE Gongjian [6200 1872 0313]

ORG: Exploration and Development Research Institute, Yumeng Petroleum Administration

TITLE: "Occurrence of the Oil Pool in the Metamorphosed Basement in Yaerxia in the Western Part of the Jiuquan Basin"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 23-30

TEXT OF ENGLISH ABSTRACT: The oil pool in the metamorphosed basement in Yaerxia was discovered in 1959. Its reservoir rock is composed of an interbed of slightly metamorphosed grayish-green and purple sandstone and Silurian arenaceous shale. Oil accumulations lie in the neighborhood of faults or at the intersection of faults and on the anticlinal axis where fractures are well developed. The overburden consists of sections in Silurian with no fractures and mudstones of Cretaceous and Tertiary.

Crude oil comes from the lower Xinmingbao group of Cretaceous in the Qingsi depression, with properties similar to those of other pools in the western part of the Jiuquan basin--paraffin-naphthenic hydrocarbons.

On the plain, the oil pool is distributed like a sheet, and in the vertical section it is divided into multiple zones. Simultaneous with the study of the area covered

[Continuation of SHIYOU XUEBAO Vol 2 No 3, 1981 pp 23-30]

by the oil pool, efforts should be directed toward finding out the lower depth limit of the pool so as to discover more reserves.

AUTHOR: LU Minggang [0719 7686 1511]

ORG: Scientific Research Institute of Petroleum Exploration and Development, Beijing

TITLE: "Source of Oil for the Western Part of the Tarimu Basin"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 31-36

TEXT OF ENGLISH ABSTRACT: There are five sets of source rocks in the western part of the Tarimu Basin, the Jurassic being a set of practical value, with abundant organic materials of very good properties and with appropriate maturity. The Cretaceous-Lower Tertiary series is a good prospect, although the conditions for oil generation along the basin margin are not so favorable. It is a marine deposit controlled by faults. Source rocks of considerable thickness supposedly exist in the Kashi-Yecheng and Awati-Luntai depressions.

Crude oils are classified into four types according to their properties. The oils from north Bancheng and Wuqia are characteristic of continental origin, with spectra of isoprenoids similar to those for the Jurassic source rocks. They originated from the Jurassic source rocks. The oils from Kuche and south Yecheng have a low pristane/phytane ratio and their vanadium/nickel ratio is greater than 1, and with the discovery of two pieces of algae fossil they are identified as of marine origin. The carbon isotopes from the crude oil are quite like those in the

[Continuation of SHIYOU XUEBAO Vol 2 No 3, 1981 pp 31-36]

Cretaceous-Lower Tertiary source rocks, so they are most probably from the Cretaceous-Lower Tertiary source rocks.

AUTHOR: WANG Ping [3769 1627]

ORG: Geological Research Institute, Shengli Oil Field

TITLE: "Occurrence of Oil in the Complex Fault Blocks in the Jiyang Sag"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 37-43

TEXT OF ENGLISH ABSTRACT: There are many complex fault block oil pools in the Jiyang sag in the northern part of Shandong Province. They resulted from intensive block-faulting of an inherited nature during the main period of oil accumulations which caused remigration of oil and gas that finally formed into pools. Evidently, these pools are controlled by fault blocks which are separated from each other by major faults of an inherited nature. Each fault block may contain several minor blocks with similar reservoir characteristics, but wide differences are apparent between the different fault blocks.

AUTHOR: TANG Zengxiong [0781 2582 3574]

ORG: Daqing Oil Field

TITLE: "A Field Pilot Test to Demonstrate the Whole Process of Water Flooding in the Daqing Oil Field"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 45-53

TEXT OF ENGLISH ABSTRACT: In order to get acquainted with the characteristics and changes of production by water flooding and to make predictions about its sweep efficiency, a field pilot test was conducted in 1965 in the Daqing Oil Field on a close-spaced well pattern. The results of the test have been proved to be reliable by means of numerical simulation and core analysis. They are summarized as follows:
1. Lower recovery-bbl/psi drop when the water cut is less than 60 percent. A steady output may be maintained if the reduction of the difference between bottom hole pressure and saturation pressure is gradual;
2. Flowing production is suitable when the water cut is less than 60~70 percent; when the water cut exceeds this limit, other means of production should be chosen on the basis of techno-economic analysis; and
3. The recovery factor by water drive in the Daqing Oil Field is 40 percent, the increase in water cut is rather rapid and the period of production with water cut is quite long.

AUTHOR: YIN Ding [1438 1353]
SUN Yueming [1327 2588 2494]

ORG: Both of the Exploration and Development Research Institute, North China Oil Field

TITLE: "Rational Rate of Recovery and Well Density in the Development of Carbonate Pools in Renqiu"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 3, 1981 pp 55-62

TEXT OF ENGLISH ABSTRACT: Rational development of a carbonate pool must be preceded by a serious study of such basic problems as the rate of recovery, well density, etc. Based on the analysis of production statistics from the Renqiu Oil Field and the numerical simulation of a water cone, a comparative study is made of the results of development with different rates of recovery and different well densities.
It is obvious that to prolong the period of production without water-cut is critical to improving the efficiency of development of carbonate oil pool, because the appearance of water in a well means the end of its steady high-yielding period. However, the choice of a rational rate of recovery is all the more important for both prolonging the period of production without water-cut and increasing the recovery factor. To ensure steady production of an oil field in line with some specific target, the rate of recovery should be so chosen as to cause a gradual

[Continuation of SHIYOU XUEBAO Vol 2 No 3, 1981 pp 55-62]

rise of bottom water, a uniform upward movement of oil-water interface and a higher efficiency of driving oil through the rock pores.

The result of our study reveals that the rational rate of recovery for the Renqiu Oil Field should be less than 2 percent. Given a specific rate of recovery, different well densities for the different stages of development will give different results. For the Renqiu Oil Field, the rational well density is 0.75 - 1 well per square km. Starting from the geological features in Renqiu and after comparing the results of exploitation of wells with different heights of oil columns, it is proposed that the wells be located in areas where the height of the oil column is equal to or greater than the average thickness of the reservoir.

9717
CSO: 4009/456

AUTHOR: LIAO Shaobao [1675 1421 5508]

ORG: Institute of Electrical Engineering, Chinese Academy of Sciences

TITLE: "Conceptual Design of Solar Energy Community"

SOURCE: Beijing TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA] in Chinese Vol 2 No 3, Jul 81 pp 236-246

TEXT OF ENGLISH ABSTRACT: This paper describes the concept of the Solar Energy Community (SEC), and adds a new significance to the original meaning of Total Energy System. The conceptual design of the SEC is made. Through an analysis comparing several forms of natural energy in rural areas, such as solar thermal, wind, biogas and small hydroelectric, it is considered that the research and development of SEC is of great importance in the search for solving the power supply problem in the countryside.

AUTHOR: SUN Guochao [1327 0948 2600]
LIAN Liwen [6647 7787 2429]
ZHOU Shaoying [0719 4801 5391]
et al.

ORG: All of the Chengdu Institute of Biology, Chinese Academy of Sciences

TITLE: "An Approach to Increasing the Biogas Yield of a Rural Biogas Digester"

SOURCE: Beijing TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA] in Chinese Vol 2 No 3, Jul 81 pp 247-251

TEXT OF ENGLISH ABSTRACT: Adding 0.3 percent $(NH_4)_2HCO_3$ to rotted straw can advance the biogas yield of a rural biogas digester significantly during the anaerobic digestion process. When compared with rotted straw to which pig and cow manure was added, the biogas yield could increase 100 percent. For barren nitrogen in the rural biogas digester, $(NH_4)_2HCO_3$ can replace human and animal wastes to obtain a higher efficiency of biogas production. When 3 kg of $(NH_4)_2HCO_3$ per cubic meter rotted straw is added, the digester can produce 14.1 m^3 biogas. The fertility of $(NH_4)_2HCO_3$ can be conserved and result in organic fertilizer which can be combined with inorganic fertilizer.

9717
CSO: 4009/455

AUTHOR: SHI Guangyan [4258 0342 1484]
WANG Zhengrong [3769 2973 2837]

ORG: Both of Anhui Provincial Research Institute of Transportation Science

TITLE: "Test Run of a Hovercraft in Chaohu"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese Vol 3 No 8, 16 Aug 81 p 9

ABSTRACT: With the help of such organizations as the Shanghai Ship Research Institute of the Ministry of Transportation, the Chaohu Shipbuilding Plant and the Anhui Provincial Research Institute of Transportation Science have successfully made China's first air-cushion vessel for local inland navigation. Repeated test runs performed most recently in Chaohu have proved that its various navigation properties meet the design requirements. It is entirely of glass fiber reinforced plastic and propelled by a single engine to a speed of 40 km per hour. It has a capacity of 40 passengers. The cabin is equipped with light and soft chairs and has a good view. Naturally, people worry about the waves and mist caused by a hovercraft such as this and the problems it may cause in inland navigation. In reality, the existing power boats stir up stronger waves as their displacement and speed are increased. The waves of an air-cushion vessel are different; they disappear soon after it passes, even through a narrow channel, due to its minimal draught; these waves have no effect on embankments or nearby small boats. There is a drawing depicting the interior view of the hovercraft and a photo taken during the test run is on the back cover.

AUTHOR: YAN Yan [0917 1484]

ORG: None

TITLE: "Clouds--Bomb"

SOURCE: Beijing XIANDAIHUA [MODERNIZATION] in Chinese Vol 3 No 8, 16 Aug 81 pp 16-17

ABSTRACT: This paper reports that in the 1950's the USA devoted a great deal of efforts to study the problem of stable burning of the liquid fuel of rockets and found the condition for converting unstable burning to explosion. The success of this research resolved the problem of reliability of large liquid fuel rocket engines and at the same time discovered the gas-liquid (fuel mist) two-phase explosion condition. The possibility of controlling and realizing fuel mist explosion began. The U.S. Navy was the first to make the FAE (fuel air explosive) in 1960. In 1967, the U.S. Navy used epoxy ethane to sweep minefields for the first time. The CBU-55 fuel air explosive was tested in 1969-1970, again by the U.S. Navy. Special characteristics of the CBU-55, different from any other explosives or bombs, are briefly discussed.

6248
CSO: 4009/469

END

JPRS 79111

1 October 1981

China Report

SCIENCE AND TECHNOLOGY

No. 129

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

[redacted]

JPRS 79111

1 October 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 129

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

NATIONAL DEVELOPMENTS

Recent Developments in PRC Computer Industry Outlined (GUANGMING RIBAO, 2 Sep 81).................................... 1

Beijing Computer Exhibition, by Zou Anshou
Applications Stressed

APPLIED SCIENCES

Briefs

Technical Achievement Awards 5

PUBLICATIONS

Table of Contents of 'GUISUANYAN XUEBAO' No 2, 1981..................... 6

Table of Contents of 'FUDAN XUEBAO (ZIRAN KEXUE BAN)' No 2, 1981....... 8

Table of Contents of 'SHENGXUE XUEBAO' No 4, 1981...................... 11

ABSTRACTS

BUILDING MATERIALS

WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS], No 2, 1981.. 13

BUILDING STRUCTURES

JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES], No 4, 1981....... 20

COAL PREPARATION

MEITAN KEXUE JISHU [COAL SCIENCES AND TECHNOLOGY], No 8, Aug 81.......... 23

ELECTRONICS

DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS], No 3, Jul 81................ 24

ELECTRIC POWER

DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS], No 4, 1981.. 29

ENGINEERING

DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY], No 2, 1981.. 32

NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY], No 2, 1981.. 39

TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY], No 2, 1981......... 45

GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA], No 2, 1981............ 52

INSTRUMENTATION

YIQI YU WEILAI [INSTRUMENTATION AND FUTURE], No 7, 1981.................. 57

IRON AND STEEL

GANGTIE [IRON AND STEEL], No 6, 1981...................................... 59

LASERS

JIGUANG [LASER JOURNAL], No 7, Jul 81.................................... 64

MACHINERY

JIXIE ZHIZAO [MACHINERY], No 6, 1981..................................... 66

NUCLEAR AND RADIOCHEMISTRY

HE HUAXUE YU FANGSHE HUAXUE [JOURNAL OF NUCLEAR AND RADIOCHEMISTRY], No 3, Aug 81.. 68

NUCLEAR TECHNIQUES

HE JISHU [NUCLEAR TECHNIQUES], No 4, Aug 81........................... 71

PHYSICS

WULI XUEBAO [ACTA PHYSICA SINICA], No 7, Jul 81........................ 72

NATIONAL DEVELOPMENTS

RECENT DEVELOPMENTS IN PRC COMPUTER INDUSTRY OUTLINED

Beijing Computer Exhibition

Beijing GUANGMING RIBAO in Chinese 2 Sep 81 p 1

[Article by Zou Anshou [6760 1344 1108]: "Our Nation's Computer Industry Realizes New Progress"]

[Text] This reporter learned from the domestically manufactured computer products exhibition which opened yesterday in Beijing that our nation's new computer industry has made new progress. In recent years, the quality of products, the systematization and software and technical services have all visibly improved, the ratio between performance and price has improved, and computer applications have also produced preliminary results.

Our nation developed her first computer in 1958. Over the past 23 years, the efforts have developed into a fledgeling industry which includes scientific research and design, production and manufacturing and applications services. The whole nation has over 100 development and manufacturing units. In recent years, various models of series of machines have continued to develop. Greater improvements have been made in the stability of the products, systematization and producing sets of equipment, the ratio of performance to price and technical services. For example, the average operating time without downtime of the DJS130 small mainframe computer, which is the one widely used nationwide, has been increased from 50 hours in the past to over 1,000 hours. The systems capacity has increased from the past "three old components" (photoelectric input, punch card output, teletypewriter) as peripheral equipment to over 20 types at present. The systems software is gradually being perfected, the costs and prices have also dropped by a large scale. To strengthen technical service, last year, the nation established the China Computer Technical Service Company and the Series Computers Software Center. This year, branch companies have been established in related provinces and cities. Each production factory has also widely established applications service agencies, provided training for users, provided technical counseling, and equipment maintenance.

According to incomplete statistics, up to the end of 1980, the number of large, medium and small computers installed by every profession and trade throughout the nation had reached 3,000. These computers have served importantly in the development of our nation's science and technology, national defense construction and national economy. Since the beginning of this year, the computer industry has implemented the guideline of readjustment of the national economy, the emphasis of work turned from production and manufacturing to popularization and application. Some typical applications test point projects which are significant for popularization have been launched in the fields of energy, light textiles industry and transportation industry. Application of the computer in our nation has expanded from mainly for scientific and engineering computations and applications in the past towards data processing, business management and real time control in each of the departments of the national economy.

This computer exhibition and sales meeting sponsored by the National Computer Industry Bureau opened at the Beijing Exhibition Hall. Comrade Wang Zhen [3769 7201] officiated at the ribbon cutting ceremony. Over 200 products by more than 90 research and development units and production units throughout the nation participated in this exhibition. The exhibits were mainly applications oriented. At the same time, some new products were exhibited. According to user demands, technical lectures and technical exchange activities will also be held. The exhibit and sales activities will last for a month and a half and the exhibit will close on October 15.

Applications Stressed

Beijing GUANGMING RIBAO in Chinese 2 Sep 81 p 1

[Article by Staff Commentator: "Take Application As the Key to Exert Efforts in Developing Our Nation's Computer Industry"]

[Text] Popularization of the application of computer technology is a question that concerns the entire situation of developing our nation's computer industry. To solve this problem well will exert an important influence upon the development of the entire national economy, national defense construction and science and culture. At present, under readjustment of the national economy, the important question of developing our nation's computer industry should be to turn from the past practice of centering around the research, design and manufacture of computer hardware rapidly towards popularization and application as the key, and to use this to lead research and development, production and manufacturing, systematization of peripheral equipment, development of applications, technical service and sales of products.

Computer technology is a leading technology. The computer industry is a new industry that serves a leading function. It is an indispensable means of modernization for the technical improvement of the national economy and national defense construction and for the realization of scientific management. At present, the level of computer technology, the scale of production and the degree of application have become important signs of the development of modern productivity. It is a profession that has developed the fastest. It has also rapidly and widely penetrated each field and has brought about great changes in production, technology, management and even social life. Data shows that in modern industrially developed nations, there are over 4,000 professions that commonly utilize computer technology. Our nation is advancing towards the building of the four modernizations. If we do not realize computerization, modernization cannot be imagined. In national defense, whether for combat weapons, strategic equipment, or technical combat command and control, the computer is indispensable. In economic buildup, replacement of a massive amount of products must realize digitization, integration, intellectualization, and these all require the computer. The design, production, quality control, management reform of products all require the computer. The entire economic activity such as planning, statistics, comprehensive balancing, financial management, capital turnover are all inseparable from the computer. Therefore, in the period of readjustment of the national economy, each profession must emphasize the use of computer technology, select and use domestically produced computer systems and equipment as much as possible so that our nation's computer industry can develop quickly.

Research and development, manufacturing of products, applications services, training of personnel are the four important parts of the computer industry which cannot be separated from each other. Of these, popularization of application and technical service are a link that we have not paid much attention to in the past. We must fully recognize this point, and in readjusting the guiding ideology and industrial structure, there must be a strategic change.

According to our nation's actual situation, we should first pay attention to the popularization of small computer and microcomputer systems. Small computer and microcomputer systems are low priced, changes in the system are more versatile, they can better adapt to the changes in user demands by the users and maintenance personnel and technological developments. Therefore, they are an inexpensive technological means in the important path to realize automation in management and control. Therefore, while developing large and medium sized new series of computers, it seems very important to develop small computer and microcomputer systems that have a great demand and that have broad applications.

Emphasizing application as the key does not mean that systematization and systems functions can be neglected nor does it mean that product quality and reliability of the operating system can be neglected, nor does it mean that the ratio of performance to price can be neglected. It is exactly the opposite. To popularize application, we must tightly grasp the two weak links of software and peripheral equipment. We must develop applications software, develop a processing system for Chinese characters, continuously perfect and expand the function of the computer system, continuously improve the reliability and stability of the system. This is to establish the material foundation for application well. To improve the competitiveness of domestically produced computers and suit the level of the domestic users, it is very important to establish a policy to lower the price.

The goal of developing the computer industry is entirely for application. Only application can open up the way, and especially by strengthening technical services for the users can the sales of products be opened up. Sales is an important economic and technical activity of enterprises, it is the key upon which the life of the enterprise depends. Sales of computers and technical service are closely related. Foreign computer factories and businesses take "user service" as the most important guiding ideology of the entire business activity of the company. The best technical personnel are assigned to sales and technical services positions. Technical service personnel and product sales personnel constitute about one third of the entire personnel of the profession. Now, application of our nation's computers has gradually turned towards the various departments of the national economy. It has expanded from scientific computation to data processing and real time control. While the strength of computer technology of the various sectors of the national economy is still weak at present, the technical problems encountered in data processing and real time control are more complicated, strengthening technical service for the users is a forceful measure to open up new fields of application. We must allow about thrity percent of the technical force to carry out applications service. Research institutes, mainframe plants, peripheral equipment plants must all place applications service in an important position. We must also readjust some units that presently duplicate production to change them to units specializing in applications service according to plan. We should mobilize special technical personnel from more enterprises and research institutes towards applications service, establish regional and even national sales service networks. Each region should strive towards a three-in-one combination of research and development, production, technical service and market sales while establishing computer industry companies. We must open up a road for broad applications through technical service to lead research and development and production. Only in this way can there by vitality. The present stage of technical service cannot be too ambitious. We should start out from the easy and advance towards the difficult and from the typical to the universal. At present, we must grasp tightly the computer applications systems which are technically more mature, which require less investment, which can produce quick results, which are worth popularization in the fields of energy, light and textile industries, transportation and management so that visible economic gain can be obtained within a short period.

Popularization of the application of computers is a strong driving force in the development of computer technology and industrial development. As long as the leadership pays attention, grasps the situation tightly, the computer industry will surely enter a new stage of development under readjustment and will serve its function in the development of the national economy.

9296
CSO: 4008/462

BRIEFS

TECHNICAL ACHIEVEMENT AWARDS--Beijing, 13 Sep (XINHUA)--At a scientific and technological work conference which lasted from 2 to 13 September in Beijing, the First Ministry of Machine Building presented certificates and cash awards in recognition of the results of 239 research projects. There are 6 first-grade, 64 second-grade, and 169 third-grade awards. Among the results of the 239 research projects, 24 are up to or close to advanced world standards, 50 have filled gaps in China's science and technology, and 131 have attained advanced standards in the country. A striking example is a high-temperature and pressure sealed structure for ammonia-synthesis towers designed by the Hefei General Machinery Research Institute. It has been used successfully on three synthetic ammonia installations in Nanjing, Guangzhou and Anqing. Because the gas leakage problem has been solved, the three installations can produce 6,000 dun more ammonia annually. [Beijing XINHUA Domestic Service in Chinese 0750 GMT 13 Sep 81 OW]

CSO: 4008/464

PUBLICATIONS

TABLE OF CONTENTS OF 'GUISUANYAN XUEBAO' NO 2, 1981

Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese
Vol 9 No 2, Jun 81 p 118

[Text] Use of Computer for Calculating Physical Properties and Designing Chemical Compositions of Glasses......Gan Fuxi [1626 4395 3588], Lin Fengying [2651 7685 5391] and Zhou Zhongyi [0719 1813 4135], all of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (119)

Studies on Hot-pressed Silicon Carbide......Jiang Dongliang [3068 2639 0081], Pan Zhensu [3382 2182 3936] and Wang Daqian [3769 1129 0578], et al., all of the Shanghai Institute of Ceramics, Chinese Academy of Sciences (133)

Investigations on Phase Diagram, Crystal Growth and Lithium Ion Conduction of $LiNbO_3$-$Zn_3Nb_2O_8$ Pseudobinary System...... Zhao Zongyuan [6392 1350 3293], Tang Disheng [0781 2769 3932] and Che Guangcan [6508 1639 3605], et al., all of the Institute of Physics, Chinese Academy of Sciences (143)

Characteristic of Tensile Strength of Optical Fibers Coated with UV-cured Epoxy Acrylate Resin......Qin Chen [4440 2525], Wang Jianguo [3769 1696 0948], Wu Huifang [0702 1920 5364] and Li Jiazhi [2621 1367 3112], all of the Shanghai Institute of Ceramics, Chinese Academy of Sciences (149)

Effect of $Ca(OH)_2$ on Alkali-Silica Reaction......Tang Mingshu [0781 2494 6615] and Han Sufen [7281 5685 5358], both of the Nanjing Institute of Chemical Technology (160)

On the Design Principle and Method of Determining the Optimum Proportion of Structural Mortars......Zhang Yunli [1728 0061 3810], Suzhou Institute of Cement Products, Ministry of Building Material Industry (167)

Time Effect and Kinetic Equation of Temperature in Ultrahigh Pressure Cell......Zhu Chengming [2612 2507 2494] and Fu Huifang [0265 1979 5364], both of the Guiyang Institute of Geochemistry, Chinese Academy of Sciences (185)

Reviews

Studies on the Systems of Rare Earth Sesquioxides-Beryllium Oxide......Yan Dongsheng [0914 2639 3932], Guo Chukun [6753 4376 1507] and Han Wenlong [7281 2429 7893], et al., all of the Shanghai Institute of Ceramics, Chinese Academy of Sciences (191)

A Review of Studies and Controversy of Al_2O_3-SiO_2 System Phase Diagram......Gao Zhenxin [7559 2182 2500], Luoyang Institute of Refractory Research (197)

Notes

Modeling Experiment on a New Type of Optical Glass Stirrer ......Chen Zuxiong [7115 4371 3574], Lu Jianying [7120 0494 5391] and Shang Zhiwei [1424 1807 0251], all of the East China Institute of Chemical Technology (218)

Electron Microscopy of Serpentin......Yand Dayu [2799 1129 1342] and Liu Wei [0491 4850], both of the Institute of Physics, Chinese Academy of Sciences; Yun Hongnian [0061 1347 1628] and Feng Beimin [7458 6056/6296 3046], both of the Institute of Sensitivity, Chinese Academy of Sciences; Jiang Shaoying [3068 4801 5391], Institute of Geology, Ministry of Building Material Industry (224)

Properties and Structure of Binary Tellurite Glasses of TeO_2-WO_3 System......Zeng Zhenhua [2582 7201 5478], Institute of Optics and Electronics, Chinese Academy of Sciences (228)

History of Science and Technology

A Preliminary Investigation of Cementing Materials Used in Ancient China......Miao Jisheng [4924 4764 3932], Li Xiuying [2621 4423 5391] and Cheng Rongkui [4453 2837 6652], et al., all of the Research Institute of Building Materials (234)

Discussion

Two Problems with the Products of Aluminum Phosphate...... Liu Genrong [0491 2704 2837], Cement Research Division, Research Institute of Building Materials (241)

9717
CSO: 4008/445

TABLE OF CONTENTS OF 'FUDAN XUEBAO (ZIRAN KEXUE BAN)' NO 2, 1981

Shanghai FUDAN XUEBAO (ZIRAN KEXUE BAN) [FUDAN JOURNAL--NATURAL SCIENCES] in Chinese Vol 20 No 2, Jun 81 p 120

[Text] Dynamic Mechanical Study of Polystyrene and Polybutadiene Blend......Yu Tongyin [0060 0681 7148], Chen Weixiao [7115 4850 1321] and Ji Xinhua [4764 2450 5478], et al., Fudan University (121)

A Study of the Mechanism of Reinforcement by Polycarbonate by Polystyrene......He Manjun [0149 2581 0689] and Zhang Zhongquan [1728 0022 2938], both of Fudan University; Zhou Xiao [0719 0876], Chemical Engineering Department, Qinghua University (128)

An Investigation of SBS Thermoplastic Elastomers--Star-shaped SBS Block Copolymers......Xu Lingyun [1776 0407 0061], Xie Jingwei [6200 7234 5633] and Tang Dexian [0781 1795 2009], et al., all of Fudan University (139)

Kinetic Studies on the Solvent Extraction (I)--Extraction Rate and Mechanism of Cerium (IV) Nitrate in the TBP-HNO_3 System......Qin Qizong [4440 0796 1350], Zhou Zuming [0719 4371 6900] and Yang Yongle [2799 3057 2867], et al., all of Fudan University (148)

Some Emendatory Data for Spectral Line Tables......Cheng Wanxia [4453 3519 7209] and Qiu Deren [6726 1795 0088], both of Fudan University (155)

A Histological Study of the Experimental Implantation of Dacron Filamentous Vascular Prostheses......Rui Jusheng [5360 5468 3932], Chen Haiming [7115 3189 2494] and Li Cilan [2621 2945 5695], all of the Department of Biology, Fudan University; Pan Zhi [3382 3112], Rao Tianjian [7437 1131 0256] and Lin Zhenqiong [2651 7201 8825], all of the Shanghai Neurological Hospital (161)

Cytohistological Studies of Plantlet Development from Cultured Stem Explants of Sequoia......Wang Kaiji [3769 0418 1015], Zhang Pifang [1728 0012 2455] and Ni Dexiang [0242 1795 4382], all of the Department of Biology, Fudan University; et al. (168)

Purification and Properties of α-Galactosidase from a Catabolite Repression Insensitive Mutant of Bacillus stearothermophilus......Shen Renquan [3088 0088 2938], Chen Zhongfu [7115 0022 1318] and Gu Qimin [7357 0366 2404], et al., all of Fudan University (177)

Isolation and Identification of the Proteinase Producing Strains and Characterization of Its Enzyme by Fermentation from n-Alkanes......Zheng Zhaoxin [6774 0340 9515], Xu Yaying [1776 7161 5391] and Lun Meijiao [0243 5019 1293], et al., all of Fudan University; Zhao Yunquan [6392 0061 3123], Shanghai Industrial Microbiology Research Institute; et al. (186)

The Detection of Viruses in Plant Cells with Immunoenzyme and Immunoelectron Microscopy Techniques......Zhu Peikun [2612 1014 0981] and Cai Tongrun [5591 0681 3387], both of Fudan University (192)

Even- and Odd-mode Inductances per Unit Length of the Coupled Slab Lines--Summation Formulas of the Ω-Series and Their Applications (II)......Dai Xianxi [2071 7359 3588], Xu Tai [1776 3141] and Huang Jingyi [7806 7234 1355], all of Fudan University (199)

The Analysis and Control of Saturate Static Magnetic Fields ......Lin Xiaobiao [2651 2556 2871], Fudan University (206)

Two New Species of the Genus Rhyncaphytoptus from China (Acarina: Eriophyoidea)......Xin Jieliu [1823 0094 0362] and Dong Huiqing [5516 1979 3830], both of Fudan University (216)

Two New Species of the Genus Amblyseius Berlese (Acarina: Phytoseiidae)......Liang Lairong [2733 0171 2837] and Ke Lisheng [2688 0536 3932], both of Fudan University (220)

Studies on O-Hydroxybenzylamine and Its Complexes (II) --The Stability Constants of Mg(II), Ca(II), Sr(II) and Ba(II) Complexes......Zhang Hualin [1728 5478 7792] and Zhuang Shanming [5445 0810 2494], both of Fudan University (223)

A Method for Determining Bivalent Iron in Rocks and Minerals which Contain Sulfide and Compounds of High Valent Manganese ......Wu Jieda [0702 0094 6671] and Yu Lianmin [0205 4886 3046], both of Fudan University (225)

A Subclass of the Hyponormal Operators--The Complete Hyponormal Operators......Li Shaokuan [2621 4801 1401], Fudan University (229)

Dissipative Operator in Spaces with an Indefinite Metric ......Tong Yusun [4547 5940 1327], Fudan University (233)

9717
CSO: 4008/441

PUBLICATIONS

TABLE OF CONTENTS OF 'SHENGXUE XUEBAO' NO 4, 1981

Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese No 4, Jul 81 on back cover

[Text] Sound Fluctuations and Internal Waves in Shallow Water......Wang Dezhao [3076 1795 2507], Shang Erchang [1424 1422 2490] and Gao Tianfu [7559 1131 6346], et al., all of the Institute of Acoustics, Chinese Academy of Sciences (218)

Recognizing Ship Objects by the Shape of Averaged Power Spectrum of Radiated Noise......Tao Dachun [7118 4648 4783], Institute of Acoustics, Chinese Academy of Sciences (228)

Theoretical Research on the Improvement of Linear Array Directivity by Using an Improving Factor......Fu Lintai [0265 5259 3141], Underwater Acoustical Institute, Ship Building Industry Company of China (236)

On the Important Role of Chinese Tones in Speech Intelligibility......Zhang Jialu [1728 1367 7498], Qi Shiqian [7871 1102 6870] and Song Meizhen [1345 5019 3791], et al., all of the Institute of Acoustics, Chinese Academy of Sciences (241)

Measurement of the Relative Change of SAW Velocity by Interference Method......Zhang De [4545 1795], Wu Wenqiu [0702 2429 5876] and Shui Yongan [3055 3057 1344], et al., all of the Institute of Acoustics, Nanjing University (248)

The Finite Element Method in Engineering Acoustics...... Shen Hao [3088 1472/6275] and Sun Hongsheng [1327 3163 3932], both of the Institute of Acoustics, Chinese Academy of Sciences (259)

Research and Technical Notes

Sound Field Structure and Measurements of Ship Self-noise ......Chen Jiachuan [7115 1367 1557] and Shan Ruzheng [0830 3067 2398], both of the Institute of Acoustics, Chinese Academy of Sciences (262)

Thickness Vibration of Electrically Loaded Piezoelectric Plate......Wang Chenhao [3076 2110 3493] and Zhao Zheying [6392 0772 5391], both of the Institute of Acoustics, Chinese Academy of Sciences (267)

Acoustical Achievements Abroad

Recent Progress in Understanding Basic Processes in Flow Acoustics...... (268)

Acoustical News...... (272)

9717
CSO: 4008/434

AUTHOR: WU Daihua [0702 0108 5478]

ORG: Wuhan Institute of Building Materials

TITLE: "A Simplified Method for Calculating the Two-way Reinforced Concrete Slab"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: A simplified method for calculating the two-way reinforced concrete slab is presented here. The load on the slab can be made to be distributed equally to deflect in two directions along the entire center line of the slab. This method leads to greater precision in calculating as compared with Marcus' method which is recommended in the current literature both at home and abroad and, in particular, it can reflect the elastic characteristics of the structure when applied to the wall of a rectangular water basin.

AUTHOR: ZHANG Nanlun [1728 0589 4858]

ORG: Wuhan Institute of Building Materials

TITLE: "The Membership and Probability Characteristics of Random Occurrences (II)"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 7-14

TEXT OF ENGLISH ABSTRACT: This is a continuation of the discussion on the membership and probability characteristics of random occurrences which appeared in a previous issue of this journal. Having studied these characteristics by means of a statistical method, we have found the relationship and difference between them. In addition, research has been done on the logical basis of this kind of statistical method.

AUTHOR: WANG Qihong [3769 0796 1347]

ORG: Wuhan Institute of Building Materials

TITLE: "The Stresses of Rheological Materials in Cylindrical Rigid Dies under Constant Strains"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 15-19

TEXT OF ENGLISH ABSTRACT: There exist two typical cases of the stresses and strains of rheological materials in cylindrical rigid dies. One of them, expressed as $\sigma_x = \sigma \Delta (t)$, has been discussed in a previous article. The other expression, $\varepsilon_x = \varepsilon \Delta (t)$, is discussed in the present paper.

AUTHOR: YUAN Runzhang [5913 3387 4545]
YANG Jinwei [2799 6930 0251]

ORG: Both of the Wuhan Institute of Building Materials

TITLE: "The Formation and Stability of Hydroxyl Ellestadite in Autoclaved Products of the Lime Quartz Mixture Containing Calcium Sulfate"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 20-33

TEXT OF ENGLISH ABSTRACT: The strength of lime-quartz products cured in an autoclave will decrease due to the formation of hydroxyl ellestadite (HXEL phase). Factors which may influence the formation of the HXEL phase are multiplicity, such as fineness of quartz, CaO/SiO_2 molar ratio, mixture, time and temperature for hydrothermal treatment and amount of gypsum used in the mixture, etc. However, it is considered that the most essential factor is the relative amount of Ca^{2+}, SiO_4^{-4} and SO_4^{-2} content in the solution. When the amount of gypsum is sufficient, the relative amounts of CaO and SiO_2 content in the solution are considered to be mainly responsible.

The average CaO/SiO_2 molar ratio of hydrates formed has been taken as the index for determining the formation and stability of HXEL. When the ratio exceeds 1, the HXEL phase can be formed and stabilized.

[Continuation of WUHAN JIANCAI XUEYUAN XUEBAO No 2, 1981 pp 20-33]

There are two reasons that the formation of the HXEL phase brings about a decrease in the strength of products: (1) a shortage of cementation in the HXEL phase itself, and (2) the reactivity of quartz decreases sharply with the formation of the HXEL phase.

AUTHOR: Tenson Tsutsui
et al.

ORG: None

TITLE: "On the Fixation of Tritiated Water with Cement Hydration (I)"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 34-42

TEXT OF ENGLISH ABSTRACT: Tritiated water is one of the radioactive wastes produced at atomic facilities. The chemical properties and physical behavior of tritiated water are the same as those of ordinary water and, consequently, it is not easy to separate tritium from radioactive waste water in the same way as is done in removing other radiochemical nuclides.

It is considered a practicable method to fix tritiated water by applying the cement hydration technique. Generally speaking, $3CaO \cdot 2SiO_2 \cdot 3H_2O$ and $Ca(OH)_2$ are produced during cement hydrating, which means, for example, that 25 grams of water will be consumed by 100 grams of cement. Therefore, considering this behavior, it may be expected that tritiated water will be fixed as the component of the hydrated cement structure.

Although it has already been found through simple experiments that much of the tritiated water moves out to surrounding water, tritiated water will be incorporated

[Continuation of WUHAN JIANCAI XUEYUAN XUEBAO No 2, 1981 pp 34-42]

into the hydration of Portland cement. Therefore, an attempt has been made to study the mechanism of the transfer of tritiated water fixed with cement.

This report shows the results and conditions of essential experiments in connection with the behavior of various kinds of cement during the curing period, soaking period, and the presence of gel, water and salt and alkali concentrations in surrounding water, etc.

AUTHOR: JIANG Minghui [5592 2494 1979]
LIU Qiuxia [0491 4428 7209]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "A Smoothness Instrument for Plate Glass"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 43-50

TEXT OF ENGLISH ABSTRACT: Based on the principle of geometrical optics and the photoelectric effect, a smoothness instrument for plate glass has been developed with a resolving power of 4.2". The factors which may affect the accuracy of measurement are analyzed; the curre characteristics and smoothness of the plate glass in connection with different industrial processes are discussed.

AUTHOR: SHI Daxin [4258 1129 9515]
XU Jian [1776 0256]

ORG: Both of the Wuhan Institute of Building Materials

TITLE: "Markovian Process and the Randomness Model for Ore Dressing"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 51-64

TEXT OF ENGLISH ABSTRACT: With reference to previous work done by others and in view of the randomness and statistics in the movement of mineral particles in ore dressing equipment or flow paths, a hypothesis is proposed as follows: When ore dressing is kept in a state of stability, although the movement conditions for various kinds of particles in the groups of particles in wide distribution may vary, the same particles (strictly speaking, of identical size, shape and specific gravity) exist in the same environmental conditions. Thus the probability of their movement is equal. The movement of various particles can be described by the Markovian randomness process. In the present paper, a randomness model studying some technological theories in ore dressing is presented using the methods of the Markovian process in connection with time continuance, limited state and homogeneous time. Some experimental tests have been made.

AUTHOR: LI Guiqing [2621 2710 7230]
QU Weilian [4234 0251 1670]

ORG: Both of the Wuhan Institute of Building Materials

TITLE: "Static and Dynamic Calculation of the Orthotropic RC Rectangular Plate Supported on Four Angles with Edge Beams"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 65-83

TEXT OF ENGLISH ABSTRACT: The equilibrium equation and boundary conditions of orthotropic RC rectangular plates supported on four angles with edge beams are formulated. The series expression for the displacement function of the plate subjected to a static load and the frequency equation of the plate under free vibration are obtained by means of the displacement method. The results have been programmed for computers.

AUTHOR: ZHOU Wanghua [0719 2489 5478]
PI Yonglin [4122 3057 2651]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "A Study on the Flexural Design Method for Composite Prestressed Concrete Beams"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 84-97

TEXT OF ENGLISH ABSTRACT: The stress of prestressing steel in composite prestressing concrete beams, because of its excess stress, can be so high as to be close to the strength of the steel when in service. This is insecure and therefore must be controlled. For the purpose of practical design a calculation method is proposed for determining the total area of steel based on the ultimate-load condition and the service-load condition. The ultimate bearing capacity of composite prestressed concrete beams is studied. It has been proved that under certain conditions the ultimate bearing capacity of composite prestressed concrete beams is greater than that of their equivalent prestressed concrete beams.

AUTHOR: HUANG Bangrong [7806 2831 2837]
WANG Fengan [3769 6265 1344]

ORG: Both of the Wuhan Institute of Building Materials

TITLE: "Research on the Cracking Resistance of the Prestressed Concrete Composite Beam with the Rectangular Section"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 98-108

TEXT OF ENGLISH ABSTRACT: The mechanical performance of the prestressed concrete composite beam with rectangular section at cracking and the effects on cracking resistance due to increasing the ultimate elongation of concrete by increasing the strain gradient at the tension zone of the section are studied. A coefficient α_D has been given for modification of the plastic coefficient ν.

The prestress loss before and after the composition of beams which may influence the cracking resistance of the composite beams is also analyzed. In addition, two methods for calculating the first crackings on the precast concrete are suggested.

AUTHOR: ZHOU Wanghua [0719 2489 5478]
PI Yonglin [4122 3057 2651]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "An Experiment on the Mechanical Properties of Composite Prestressed Concrete Beams"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 109-129

TEXT OF ENGLISH ABSTRACT: This paper describes an experiment on the mechanical properties of composite prestressed concrete beams with rectangular section. An analysis is made of the test results of 15 composite prestressed concrete beams with rectangular section. It can be concluded that under suitable conditions composite prestressed concrete beams, when compared with their equivalent prestressed concrete beams, have the following characteristics: 1) stress excess of prestressed steel, 2) strain lag of added concrete, and 3) increase of strain gradient in the tensile zone of concrete when the composite section is subjected to a load. It has been proved that the stress distribution over the compressed zone of the prestressed component under constructional load, the added concrete having hardened and the composite section being subjected to the design load, would correspond to the effect of a certain prestress. The prestress is referred to as a load prestress. The effect of the mechanical properties of composite prestressed concrete beams on their behavior is also discussed.

AUTHOR: ZANG Anmin [5258 1344 3046]

ORG: Wuhan Institute of Building Materials

TITLE: "On Calculating the Transverse and Longitudinal Stiffness of a Single-story Industrial Workshop"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 2, 1981 pp 130-138

TEXT OF ENGLISH ABSTRACT: It is necessary to have good control of the stiffness of a shop equipped with a heavy or intermediate duty crane for the purpose of guaranteeing its quality, improving the working conditions and making sure that the crane will work properly. A practical and simple method is thus proposed for calculating the transverse and longitudinal stiffness of a single-story workshop. This is intended as a reference for structural designers.

9717
CSO: 4009/410

AUTHOR: None

ORG: Codes Research Department, Institute of Building Structures, Chinese Academy of Building Research*

TITLE: "A Methodology of Probability-based Limit States Design--Some Concepts on the Draft of 'Common Unified Standard for Building Structures Design' in China"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 1-18

TEXT OF ENGLISH ABSTRACT: This paper introduces briefly the methodology of probability-based limit states design, which is adopted in the draft of "Common Unified Standard for Building Structures Design" in China.

The paper emphasizes concepts of the above-mentioned method, including variability of loads effect and resistance, combination forms of loads effect, measurement of structural reliability and its probability analysis, structural target reliability indices and grades of safety, design expressions for structural members and determination of partial coefficients, as well as corresponding relations between structural reliability and quality control of structural materials and members, etc. The characteristics of the Standard are also stated briefly.

* Text of the article is by LI Mingshun [2621 2494 7311], SHAO Zhuomin [6730 0587 3046] and MA Kunzhen [7456 0981 6297].

AUTHOR: XU Guolin [1776 0948 2651]
TANG Guoying [3282 0948 5391]
DING Dajun [0002 1129 6874]
PANG Tonghe [1690 0681 0735]

ORG: XU and TANG both of the Northeast Power Plant Design Institute, Ministry of Power Industry; DING and PANG both of the Department of Civil Engineering, Nanjing Institute of Technology; Power Line Materials Factory, Power Bureau, Yunnan Province; Well Pipe Factory, Mechanized Works Company, Jiangsu Province

TITLE: "Experimental Study on Stiffness and Crack of Reinforced Concrete Ring Section Members in Bending"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 19-33

TEXT OF ENGLISH ABSTRACT: According to the test results of three series of specimens, the formulas for computing the stiffness and crack width on the section of reinforced concrete ring members subjected to bending are suggested. The comparison of the results from calculation and tests shows satisfactory agreement. The formulas suggested in the paper are simpler and their forms are similar to those of the corresponding formulas given in the current code, so it is easier to use them in practice. In addition, the authors have tried to present a statistical formula for computing the probable (at a certain level of security) maximum crack width.

AUTHOR: CHEN Yongqi [7115 3057 4359]
LIU Xihui [0491 6932 5634]
GONG Sili [7895 1835 4409]

ORG: All of the Chinese Academy of Building Research

TITLE: "The Artificial Earthquake Ground Motions Compatible with Standard Response Spectra"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 34-42

TEXT OF ENGLISH ABSTRACT: This paper addresses itself to earthquake ground motion simulation. The approach to generating artificial accelerograms presented here is based on the approximate relationship between acceleration response spectra and power spectra. By using the standard response spectrum specified in the current seismic design code for building as the target, a computer program, ASEW, is compiled. The analysis of some results is worked out in this paper and problems concerned with it are discussed, such as the influence of artificial ground motion duration on the response spectrum resulting, the time of iteration algorithm adopted in the computer program, etc.

AUTHOR: CHEN Huanqiang
et al.

ORG: None

TITLE: "Measurement and Analysis of Natural Vibration Characteristics of Column-type Structures:

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 43-55

TEXT OF ENGLISH ABSTRACT: Based on the measurement data of 96 standing column-type structures, formulas for calculating natural periods of vibration and vibration modes of these structures are presented. The formulas are derived by analyzing the measured vibration modes and using the Hamilton theorem in analytical mechanics together with the Ritz method for resolution. The results obtained from calculation are tested by the measured vibration modes of 25 such structures. The differences between them are quite small. Calculation tables for simplified work are listed in the paper.

AUTHOR: BAO Zhisun [7637 6347 1327]

ORG: Fifth Design and Research Institute

TITLE: "The Direct and Reasonable Design of Rectangular Sections of Reinforced Concrete Members Subjected to Biaxial Bending and Compression"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 56-63

TEXT OF ENGLISH ABSTRACT: The method of converting relative cover depth is proposed in this paper, thereby reducing the number of calculating parameters for reinforced concrete sections subjected to biaxial bending and compression. With the aid of the design charts included in the article, the reinforcement of these sections can be designed directly. Furthermore, suggestion for improving the formula for the strength of the section subjected to compression load with small eccentricity in the current code TJ 10-74 is also made in this paper.

AUTHOR: CHEN Haobin [7115 4110 1755]

ORG: Fujian Institute of Building Design

TITLE: "Practical Calculations of Contact Reactions for Box Foundations"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURES] in Chinese No 4, 1981 pp 64-78

TEXT OF ENGLISH ABSTRACT: Based on recent research and measurement results of tall building box foundations, contact reactions and their causative factors are discussed and compared in this paper. The method of calculating contact reactions by the layers summation procedure is improved and tables compiled for practical use are included. With this, the reactions and conventional settlements can be calculated on the same basis as were the causative reaction factors. Calculated results agree fairly well with measured values. The suggested methods are also adaptable for calculating contact reactions of a rectangular box foundation on layered subsoil conditions.

9717
CSO: 4009/463

AUTHOR: ZHANG Dianzeng [1728 3013 1073]

ORG: None

TITLE: "Tapping the Potentials and Transforming the Techniques of Coal Preparation Plants"

SOURCE: Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 8, Aug 81 pp 6-11

ABSTRACT: Since the liberation, there have been great developments in China's coal washing and processing industry. There are now 105 washers with a design capacity over 10^8 tons and China now has the capability of designing, manufacturing the equipment, and establishing large coal washers. Compared with the advanced technology of the world, China remains backward in this field, however, in so far as the equipment being relatively old, the capability of floating heavy material poor, various parts of the equipment often incomplete, and results of coal selection inferior. Measures for replacing the old equipment with contemporary designs of W. Germany, Australia, the USA, Britain, France, Japan, and the USSR are detailed. The paper claims that future developments of China's coal preparation industry are, of necessity, to be in the direction of large size plants, an emphasis on floating heavy material, and further automation by adopting techniques of remote control, remote testing, computer control, and industrial television to reduce the number of workers in a 3-million-ton advanced coal washer to 300 persons.

AUTHOR: LI Zhongxin [2621 1813 0207]

ORG: Engineer, Bureau of Science and Technology, Ministry of Coal Industry

TITLE: "Ways of Reclaiming Coal From Rejects in the Coal Preparation Process"

SOURCE: Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 8, Aug 81 pp 53-54

ABSTRACT: Nationally, the heat energy utilization rate of coal is very low in China, only about 28 percent, while that of industrially developed countries is close to 50 percent. More than 70 percent of the coal distributed to the users are not prepared, hence the waste. If the washing and processing rate of coal is raised from the current low ratio to improve the quality and adjust the variety for reasonable utilization to add 10^8 tons of raw coal to the processing plants, it is estimated that 10 million tons of coal a year may be saved by the 4 large users of the metallurgical, power generating, railway, and chemical industries. The paper details the methods of reclaiming, through selection and processing, the coal used by locomotives, power generating plants, etc. Simple work processes of using non-magnetic medium to reclaim coal from gangue, coal washing waste water, etc. are introduced.

6168
CSO: 4009/470

AUTHOR: LIU Zhenwei [0491 2182 1218]

ORG: Institute of Spacecraft System Engineering, Chinese Academy of Space Technology

TITLE: "The Element Pattern-steerable Adaptive Circular Arrays"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 137-142

TEXT OF ENGLISH ABSTRACT: In this paper the element pattern-steerable adaptive circular arrays are described. The element consists of three orthogonal dipoles. All the element radiation patterns in the array can be steered by a set of weightings to point to an arbitrary specified direction. Thus a high directional beam in an arbitrary directional position within a three-dimensional space can be formed to capture a desired signal effectively. On the above basis the techniques of the adaptive linear array of uniformly spaced isotropic elements investigated by W. F. Gabriel are generalized to the special topic of the element pattern-steerable adaptive circular arrays by means of the concept of equivalent interference source.

This paper discusses the following theoretical aspects of the said arrays: the array far-zone radiation field, the direction-controlled weighting factors of the element radiation pattern, the covariance matrix of the set of system inputs, the orthogonal resolution of the array output pattern, the transient characteristic for total output noise power of the array system.

AUTHOR: DU Shimin [6757 0013 3046]

ORG: Beijing Institute of Radio Measurement

TITLE: "The Characteristics of the Scattering Patterns from a Subreflector of a Monopulse Antenna"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 143-151

TEXT OF ENGLISH ABSTRACT: This report covers the studies of the characteristics of the scattering patterns from a subreflector of the modified monopulse dual reflector antennas. In this report, first the basic computed formulas of the far-field "sum" and "difference" scattering patterns are deduced, and then the computed and measured results of the scattering patterns for the antenna of about 60 λ diameter are obtained. By the analysis and experiment of the scattering characteristics of a subreflector of the monopulse antenna, a high "sum" efficiency and slope of secondary "difference" pattern can be obtained using optically shaped reflector approach. Finally, the measured results of the modified cassegrainian monopulse antenna are given.

AUTHOR: BIAN Peng [0593 1756]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "Recent Progress in Studies on Oxide Cathodes Using Surface Techniques"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 152-159

TEXT OF ENGLISH ABSTRACT: A review is made of recent progress in the study of oxide cathodes using surface techniques. Beginning with the careful and rather detailed studies of the thermionic properties of BaO, thus leading to the Ir-BaO cathode initiated by the NRL group, we pass over to report surface studies of the triple carbonate cathode, thereby touching on the so-called Medicus cathode.

AUTHOR: REN Yu'an [0117 5940 1344]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "One-dimensional Analysis of Heat Conduction of the Open-type Slow Wave Structure"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 160-166

TEXT OF ENGLISH ABSTRACT: In an O type high power travelling wave tube (TWT), its power capacity is determined by the heat conduction characteristics of the slow wave structure (SWS). When the open type SWS is supported by dielectric rods of trapezoid shape in the cross section, the one-dimensional equation of the temperature difference between the hot spot of the SWS and the barrel of the tube is derived in this article. The temperature difference value determines the power capacity of the TWT. The equations obtained are then applied to analyze different kinds of practical open type SWS. Theoretical calculation is in good agreement with measurement. Some values of temperature difference for several practical SWS, some of which are made by a spring pressed and some by brazing, are given for comparison and for use in technological design and analysis.

AUTHOR: YE Yulin [5509 3022 2651]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "The Electric Charge Accumulation in the Color TV Light Valve Tube"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 167-172

TEXT OF ENGLISH ABSTRACT: This paper explains the image expansion and confusion of red and blue caused by the electric charge accumulation on the oil film in the color television light valve tube.

AUTHOR: ZHAO Liping [6392 4539 1627]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "Self-sharpening Effect of Electron Beam Landing on Target in Vidicon"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 173-184

TEXT OF ENGLISH ABSTRACT: In this paper the self-sharpening effect of electron beam landing on the target in a vidicon and its influence on resolution of electron beam have been digitally analyzed with a computer. The mathematical-physical models applied are as follows: The distribution of current density in electron beam is Gaussian; the energy distribution of electrons in beam is Maxwellian; and the signal-readout model is capacitor discharge model. When the model of cross section of the beam is one-dimensional, the self-sharpening effect of the beam is 1¼" and 2/3" plumbicon, 1" Sb_2S_3 vidicon and 1" saticon is computed. In addition, their influence on AR (amplitude response) of electron beams has been computed. The influences of beam current, signal current, equivalent temperature of beam, target capacitor and velocity of scanning on the self-sharpening effect have been analyzed. When the model of the cross section of the beam is two-dimensional, the self-sharpening effect of the beam in 1¼" plumbicon is given as an example.

AUTHOR: HONG Pu [3163 3184]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "A Long Pulse Large Area Intense Electron Beam Source"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 185-190

TEXT OF ENGLISH ABSTRACT: The long pulse electron beam system reported here was constructed for transverse pumping and e-beam sustained discharge large energy gas laser. The electron beam parameters are: beam energy about 200-250 keV, pulse duration (FWHM) about 1-3 μs, current density in 0.5 - 8 A/cm^2 range and beam area 100 x 10 cm^2. With this system, we have performed XeCl laser experiments and obtained laser energy output ~1 J in 1.9 l active volume. Recently this system was used as a pumping source for a CO_2 laser, and we have preliminarily obtained 360 J laser energy in 7.85 l active volume.

AUTHOR: BAI Zhengang [4101 2182 4854]
JIANG Dingjian [3068 1353 0256]
ZHANG Honglai [1728 3163 0171]
ZENG Zhaosi [2582 2507 0203]

ORG: All of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "A High Current Density Thermionic Cathode"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 191-192

TEXT OF ENGLISH ABSTRACT: A dispenser cathode which consists of a porous body of tungsten impregnated with barium scandate has been developed. It has good properties: high emission current density, low evaporation rate, good reactivation ability after poisoning and long life. This kind of cathode is suitable for use as an electron emitter for certain high power microwave tubes, etc.

AUTHOR: LI Xianglin [2621 4382 2651]
CAO Youjiang [2580 1635 3068]

ORG: Both of the Shanghai Wire Communications Factory

TITLE: "A Simple Way to Handle the Problem of Loading with Multilayered Dielectric Sheaths Outside the Array Aperture"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 193-195

TEXT OF ENGLISH ABSTRACT: In this paper the effects of dielectric sheet on the array antenna are described based on the element cell. The formulas suitable for computer calculation are derived by use of the transmission line circuit theory. Useful results are obtained by use of computer type-719, and the correctness of the results is discussed. The theoretical data are in agreement with experimental results obtained from the waveguide simulators.

AUTHOR: JIANG Zunfu [1203 6690 1381]

ORG: Institute of Electronics, Chinese Academy of Sciences

TITLE: "An Improved Algorithm for FFT"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 3, Jul 81 pp 196-200

TEXT OF ENGLISH ABSTRACT: An improved algorithm for FFT is proposed. The Fourier transforms of a complex discrete sequence with $N = 2^{\gamma}$ points are performed by the operation of $(\gamma-3)$ N/2 times of multiplication. The speed of the algorithm is faster than the conventional FFT. The speed up ratio is about $3/(\gamma-3)$.

9717
CSO: 4009/413

AUTHOR: MA Huaxiao [7456 5478 1321]

ORG: Chengdu Plant No 65

TITLE: "The Logical Analyses of Operational Types and Probability Calculation for Reliability in Power Systems"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 4, 1981 pp 3-12

TEXT OF ENGLISH ABSTRACT: This paper suggests one logical expression for schematic diagram of power systems, and also an optimum expression if any limiting conditions of minimum term are not to be applied repeatedly. The logical expressions for a power system may be applied to the logical analyses of operational types of a power system, and the optimum expression through logics-probability transformations may then be applied to probability calculation for reliability of a power system. The "Theorem of Equivalent Transformations for Logics" and "Rules for Logics-Probability Transformations" in the literature are applied to analyze and calculate the probability problems in various systems of complicated constructions. Methods suggested for calculating the reliability concerning power systems by some foreign specialists are briefly discussed.

AUTHOR: WU Liefeng [0702 3525 1496]

ORG: Nanjing Automation Research Institute

TITLE: "Microcomputer-based Remote Terminal Unit and Its Application to the Control of Water Turbine Generators"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 4, 1981 pp 13-19

TEXT OF ENGLISH ABSTRACT: The computer distributed processing system is a configuration of higher reliability and processing efficiency in real-time control systems. Practical application of this configuration is possible since its combination with microcomputers.

The remote control unit (RTU), or unit automatic control equipment, is the backbone of a distributed processing system. It is a subsystem by which the object is directly handled and controlled. This paper describes the function of the RTU in the distributed system as well as its hardware construction and software task, and recommends its application to the control of water turbine generators.

AUTHOR: FANG Peifeng [2455 1014 6265]

ORG: Nanjing Automation Research Institute

TITLE: "The Programming for SXJ-1 Event Sequence Logging and Display Set"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 4, 1981 pp 20-30

TEXT OF ENGLISH ABSTRACT: SXJ-1 event sequence logging and display set, employing microprocessor as its CPU, is a new supervisory control system used in power systems in China. This paper describes the programming for this device and its main features.

AUTHOR: FANG Huiqin [2455 6540 2953]
et al.

ORG: Nanjing Automation Research Institute

TITLE: "Debugging SXJ-1 Event Sequence Logging and Display Set in Lab and in Test Run"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 4, 1981 pp 31-42

TEXT OF ENGLISH ABSTRACT: The SXJ-1 device is the first microcomputer-based event sequence logging and display set for an electric power system in China. This paper describes some problems encountered in debugging hardware and software by means of the development system EXORterm-200 in the laboratory and in its test run in a power plant.

AUTHOR: LU Jihuang [7120 4949 3874]

ORG: Nanjing Automation Research Institute

TITLE: "Research on the Principle of New Static Percentage Phase-comparison Busbar Protection"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 4, 1981 pp 43-52

TEXT OF ENGLISH ABSTRACT: This paper introduces the principle of a new busbar protection used in HV or EHV power systems. In case of the possible reverse current during an internal fault on 1-1/2 CB busbar and other busbars, common phase-comparison busbar protection will fail to operate. This paper describes the principle of a new percentage phase-comparison busbar protection which can reliably operate in spite of the existence of reverse current.

In this paper, theoretical analysis is presented and the practical method for performing the protection is proposed.

9717
CSO: 4009/464

AUTHOR: WANG Yunda [3769 6663 6671]

ORG: Department of Mathematics, Northeast Institute of Technology

TITLE: "On Some Properties of Riemannian Space of Quasi-constant Curvature"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 1-5

EXCERPT FROM ENGLISH ABSTRACT: By a space of quasi-constant curvature we mean a Riemmanian space satisfying a certain given condition, and by a quasi-umbilical hypersurface we mean a hypersurface satisfying another given condition. The main results are given in this paper.

AUTHOR: LIANG Zhide [2733 1807 1795]
XU Jiazhen [1776 1367 2823]
WANG Fu [3769 4395]

ORG: All of the Department of Metallography, Northeast Institute of Technology

TITLE: "Three-dimensional Orientation Analysis for Cold-rolling Titanium Alloy (TA7) Sheet"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 7-15

EXCERPT FROM ENGLISH ABSTRACT: The paper is written to introduce a group of coefficients of weights b^{i}_{ln} for talculating the coefficients of ODF series w_{lmn} as shown by the given formula. An ALGOL-60 program has been written on this understanding in order to calculate the ODF for hexagonal materials and, furthermore, to determine the cold-rolling texture of TA7 titanium alloy sheet.

AUTHOR: LIANG Zhide [2733 1807 1795]
XU Jiazhen [1776 1367 2823]
WANG Fu [3769 4395]

ORG: All of the Department of Metallography, Northeast Institute of Technology

TITLE: "Charts for Interpreting the Crystallite Orientations of Both the Cubic Materials and the Hexagonal Materials"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 16-22

TEXT OF ENGLISH ABSTRACT: With the outputs of ALGOL-60 programs interpreting the crystallite orientation distributions of both the cubic materials and the hexagonal materials in terms of Euler space, this article suggests all the charts for identifying constant φ sections ($\Delta\psi = 5°$) of the ODF, and also the corresponding lists of all Euler angle values (i.e., ψ, θ, φ) of low indices ideal textures. Utilizing these charts, texture analysis of the sample becomes rather simple and intuitive. These programs are a constituent part of our library for ODF analysis.

In addition, a table is offered to demonstrate which sections of ODF are more valuable in texture analysis and which are merely intended for reference.

AUTHOR: LIN Zhaoqi [2651 5128 3823]
SUN Guijing [1327 6311 4842]
XU Haifeng [6079 3189 1496]

ORG: LIN and SUN both of the Department of Metallography, Northeast Institute of Technology; XU of the Northeastern Light Alloy Processing Plant

TITLE: "Some Problems in Development of High Strength Weldable Al-Zn-Mg Alloys"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 23-35

TEXT OF ENGLISH ABSTRACT: In this paper, the influences of the ratio Zn/Mg and the minor copper addition of the mechanical properties, weldability and SCR (stress corrosion resistance) of high strength weldable Al-Zn-Mg alloys and the selection of welding wire are discussed. The experimental results show that there exist reasonable performance indexes of strength, ductility and SCR as well as receivable weldability, while the ratio Zn/Mg of alloys and joints is equal to about 2.73. As the minor copper addition is less than 0.4 wt percent, the strength and ductility of base metal will not be substantially improved but, on the other hand, the strength and ductility (δ and α) of weld joints decrease as the amount of copper added is increased over 0.4 wt percent. The reasonable copper addition may be considered to be 0.3 wt percent for which the SCR can be greatly improved without any serious disadvantage to the weldability. The comparative tests show that the

[Continuation of DONGBEI GONGXUEYUAN No 2, 1981 pp 23-35]

welding wire $AlMg_6$ containing high magnesium is suitable for welding the high strength weldable Al-Zn-Mg alloys. If the selected welding wire is the same as the base metal, the high contents of both Mg and Zn in welding wire should be ensured and the Mn content must be restricted to a level below or equal to 0.2 wt percent.

AUTHOR: TAN Yanchang [6223 1693 2490]
LIU Guolu [0491 0948 4389]
HE Bin [0149 2430]

ORG: All of the Department of Precision Alloys, Northeast Institute of Technology

TITLE: "On the Selection of Reasonable Technology to Obtain Several Kinds of Elinvar Alloys with Low Resonant-frequency Temperature Coefficient"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 37-44

EXCERPT FROM ENGLISH ABSTRACT: The effects of cold-working and aging treatment on the frequency temperature curves of some kinds of Fe-Ni based alloys (Elinvars) of low resonant-frequency temperature coefficient are dealt with in this article.

AUTHOR: SHI Yongle [2457 3057 2867]

ORG: Department of Mechanical Principles, Northeast Institute of Technology

TITLE: "An Analysis of Forms of Worm Thread"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 45-60

EXCERPTS FROM ENGLISH ABSTRACT: There are different forms of worm thread, such as Archimedes worm, involute helicoid worm, chased helicoid worm and milled worm, etc. The shorter service life of worm gearing under observation in several factories has been mainly caused by the incorrect meshing of worm and gear and, more specifically, the worm thread form usually does not match the tooth profile of the gear.

This paper offers a method to form the surface of worm thread by means of a spiral motion of the contact line on worm related to a cutter. Hence the thread surface, the form of worm thread on axial section and the pressure angle α_0 on pitch circle, etc., may be determined or calculated by some general formulas.

AUTHOR: MAO Zhonghui [3029 0022 6540]

ORG: Department of Mechanical Principles, Northeast Institute of Technology

TITLE: "A Mechanism for Precise Reappearance of Quadratrix--The Curvilinear Mechanism Useful for Dividing an Angle into Several Equal Angles as Required with Accuracy"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 61-66

TEXT OF ENGLISH ABSTRACT: The problem often comes up in engineering practice of how to equally divide an angle into several required angles. An answer to such a problem habitually used is the method of approximate calculation. In view of the fact that the accuracy of this method is insufficient, a new mechanism for the reappearance of the quadratrix (which was first put forward by Hippais, an ancient Greek Sophist) is presented in this paper. It is proved that an angle can be divided equally into three angles with accuracy by using this mechanism. The features and composition principle of the mechanism are discussed. The mechanism, designed based on a composition principle of higher pairs in a plane as shown in the figures, is a type of five-bar-and-one-gear mechanism by which a quadratrix may be plotted in a defined angular interval by the crank. As shown by the formula

$$\frac{\theta}{i} = (K-1)\frac{\pi}{2i} + \frac{\phi}{i}$$

[Continuation of DONGBEI GONGXUEYUAN No 2, 1981 pp 61-66]

the features of this mechanism can be extended efficiently to a precise task dividing an arbitrary angle into several angles as required with accuracy, where θ is an arbitrary angle, K the number of quadrants (K = 1, 2, 3 and 4), ϕ the acute angle and i the number of equal angles to be divided as required.

AUTHOR: XIAO Zeqiang [5135 3419 1730]

ORG: Northeast Institute of Technology

TITLE: "Plume Model for the Phenomena of Gas Bubble Pumping as Injecting Gas into Ladle"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 67-80

EXCERPTS FROM ENGLISH ABSTRACT: The phenomena of gas bubble pumping in the ladle stirred by gas injection was studied in this work. A plume model has been suggested to describe such a phenomenon. The plume model makes it possible to quantitatively analyze the relation between the stirring intensity and the energy supplied by gas. In such a case the buoyancy of bubbles is the cardinal force in liquid and, therefore, the initial momentum of gas flow can be considered as negligible. It follows that the momentum flux of gas-liquid flow in Z-section M should be equal to the buoyancy to bubbles. Based on the experimental determination of some parameters of the liquid flow in a 60 t ladle, a formula to determine the amount of liquid entrained by gas bubble pumping has been obtained.

AUTHOR: XU Wenpai [1776 2429 3175]
QIAN Hongjun [6929 3163 0193]
BAI Qingshun [4101 1987 7311]
ZHU Weiyong [2612 0251 0516]

ORG: All of the Northeast Institute of Technology

TITLE: "Penetration Length of a Side-blown Oxygen Jet by Immerged Lance in Molten Steel Bath"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 81-89

EXCERPT FROM ENGLISH ABSTRACT: The purpose of this article is to find a mathematical formula to express the penetration length of a side-blown oxygen jet by an immerged lance in molten steel bath in terms of the decisive criterion of similitude (Archimedes criterion) and the inclined angle of the lance.

AUTHOR: HUANG Shifang [7806 1102 5364]
JIN Guodong [6855 0948 2767]

ORG: Both of the Rock Fracturing Teaching and Research Group

TITLE: "Acoustic Emission of Rock under Penetration Fracture"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 91-100

EXCERPT FROM ENGLISH ABSTRACT: This paper is written with the aim of trying to investigate the mechanism of rock fracture by way of acoustic emission. Experiments of acoustic emission have been carried out by statically penetrating the bit into rock samples which are the marbles we adopted.

AUTHOR: Kai Grjotheim

ORG: Professor, University of Oslo, Norway, and Honorary Professor, Northeast Institute of Technology, China

TITLE: "A Comment on the Aluminum Chloride Electrolyzing Process for Making Aluminum"

SOURCE: Shenyang DONGBEI GONGXUEYUAN [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 101-108

EXCERPTS FROM ENGLISH ABSTRACT: Aluminum has been produced both by chemical and electrochemical processes. The Hall-Heroult process is, basically, an electrochemical process with some features of chemical reduction, but the Alcoa aluminum chloride process is a pure electrochemical reduction process. This paper attempts to give an introduction to and comment on the Alcoa process. In short, the practical problems encountered in developing an aluminum chloride electrolyzing process have yet to be solved and, therefore, putting it into effect on an industrial scale is time consuming. Obviously this process cannot compete with the Hall-Heroult process in the near future.

9717
CSO: 4009/414

AUTHOR: DAI Decheng [2071 1795 2052]

ORG: Nanjing Institute of Technology

TITLE: "Nonlinear Plane Vibrations in the Attitude Dynamics of Artificial Satellite"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 1-10

TEXT OF ENGLISH ABSTRACT: In this paper the defects of the research work on nonlinear plane vibrations in the attitude dynamics of the artificial satellite are pointed out. Based on the method of analysis with several rapidly rotating phases as presented in previous articles, the existence and stability of nonlinear plane vibrations are discussed with some rigor. The existence of quasi-periodic vibration in the system in nonresonant cases is shown.

AUTHOR: FAN Ming [5400 6900]

ORG: Nanjing Institute of Technology

TITLE: "Flow Chart Proposed and Theoretical Analysis on the Super-low-pressure Air Separation Plant"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 11-26

TEXT OF ENGLISH ABSTRACT: In this paper a simple and practicable flow chart for the super-low-pressure air separation plant is proposed. The electric energy consumption of the plant may be as low as 0.4 KWH per $NM^3 O_2$; the bigger the plant, the less will be the electric energy consumption rate. Mathematical analysis of the refrigeration system and fractional distillation system of the plant provides a basis for plant design. Taking a 30,000 NM^3O_2/h plant as an example, a flow chart is designed and the theoretical number of fractional column trays is calculated.

AUTHOR: MAO Fuming [3029 4395 2494]

ORG: Nanjing Institute of Technology

TITLE: "High-efficiency Ion Source Used in Quadrupole Mass Spectrometer"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 27-31

TEXT OF ENGLISH ABSTRACT: In this paper, a design theory for focusing ions with electron space-charge is presented. The sensitivity of a mass spectrometer designed according to this theory is raised by 2~3 orders of magnitude, and the resolution is improved remarkably. This theory is also applicable to the ion sources used in other mass spectrometers.

AUTHOR: LING Yiming [5677 0001 7686]

ORG: Nanjing Institute of Technology

TITLE: "Experimental Study on Properties of Ar^+ Lasers with Glass Envelopes"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 32-40

TEXT OF ENGLISH ABSTRACT: In this paper, an experimental study on several fundamental properties of Ar^+ lasers with glass envelopes and disk bore discharge tubes is reported, including the gaseous effect in the laser tube, laser power output, etc. Brief qualitative explanations are also given for the experimental results.

AUTHOR: SUN Zhongliang [1327 1813 5328]
SHEN Chuyu [3088 2806 3768]

ORG: Both of Nanjing Institute of Technology

TITLE: "94 GHz Gunn Effect Oscillator"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 41-48

TEXT OF ENGLISH ABSTRACT: This paper describes a Gunn effect oscillator using the second harmonic as its output. The second harmonic power output of the oscillator is obtained by making use of the nonlinear characteristic of a Gunn oscillation. Thus with a single Gunn diode, functions of fundamental oscillation and frequency multiplication are accomplished simultaneously.

According to this principle, a 94 GHz oscillator using 6 mm-band diode has been developed. At a fundamental frequency of 47 GHz, the power output of the oscillator at the second harmonic 94 GHz is 20 mw. This new type of oscillator has been used as a laboratory signal source as well as the local oscillator in system applications.

AUTHOR: CHEN Duxin [7115 4648 0207]
WANG Yunyi [3769 5686 0308]

ORG: Both of Nanjing Institute of Technology

TITLE: "Computer-aided Analysis of FM-AM Direct Converter in Receivers for Satellite Broadcasting"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 49-57

TEXT OF ENGLISH ABSTRACT: In this paper, a quantitative analysis for one design of a FM-AM direct converter is made with the aid of computers. Taking into consideration the effects of nonlinearity of the diode, the relation between the output of slope filter and frequency deviation, and also the formulas for calculation of differential gain and differential phase are derived. A series of computations of the above-mentioned characteristics are carried out on computers. From the results of computations, several conclusions can be drawn about the proper selection of the operating state of the converter in order to reduce distortions.

AUTHOR: DING Dajun [0002 1129 6874]

ORG: Nanjing Institute of Technology

TITLE: "Some Problems in Stiffness Calculation of Reinforced Concrete Members"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 58-68

TEXT OF ENGLISH ABSTRACT: This paper deals with three problems in the stiffness calculation of reinforced concrete members. They are: (1) the synthetic coefficient ζ for determining the average strain of concrete at the edge compressive fiber, (2) the parallel relationship between the curves of computed steel strain ε_g and measured average steel strain $\bar{\varepsilon}_g$, and (3) modification based on the parallel relationship for formula of the coefficient ψ characterizing the nonuniform distribution of steel strain along eccentrically compressive member. The reasons to take ζ as a constant under service load and its recommended value in the current Code TJ 10-74 are verified by means of the bending stress-strain curve of concrete. The author also shows that the prerequisite conditions for the stiffness formula and the values of coefficients in the Code are well coordinated.

AUTHOR: ZHAO Zhimei [6392 5347 4168]
XIE Xijun [6200 6932 0193]

ORG: Both of the Nanjing Institute of Technology

TITLE: "Study of Dynamometer for Surface Grinding"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 69-84

TEXT OF ENGLISH ABSTRACT: In this paper, formulas of bending moment, stress and deflection for a circular ring are derived. The characteristics of a circular ring used as the elastic element of a dynamometer are discussed, and it is shown that a thick ring with a larger ration of t/R should be adopted rather than a thin ring. Three dynamometers for surface grinding of the elongated octagonal-ring type of different sizes and different designs are developed. Calibrations and grinding tests show that the characteristics of an elongated octagonal ring are similar to those of a circular ring and that the double elongated octagonal-ring type dynamometer with an integral thick wall is a satisfactory design.

AUTHOR: WEN Wenyuan [3306 2429 3293]
GE Qiaoqin [5514 1564 3830]

ORG: Both of Nanjing Institute of Technology

TITLE: "Computations by the Finite Element Method for Static and Dynamic Characteristic Analyses of Machine Tool Structures (2)"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 85-95

TEXT OF ENGLISH ABSTRACT: Based on a previous paper, a study is made of the computation method using elements of various types (triangular and rectangular element) for static and dynamic characteristic analyses of machine tool structures. Relations between the types of element and the speed of convergence are analyzed. An appropriate model for thin-walled machine tool structures is investigated. At the end of this paper some proposals are made based on the results of computations.

AUTHOR: FENG Shaoxuan [7458 4801 6178]

ORG: Nanjing Institute of Technology

TITLE: "Application of the Nomograph to Construct the Basic Views of a Circle in an Oblique Plane--On Application of the Nomograph in Mechanical Drawing (1)"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 96-110

TEXT OF ENGLISH ABSTRACT: This paper discusses the application of nomographs in mechanical drawing practice to simplify the construction process and raise the working efficiency. The author suggests that, in mechanical drawing, all the constructing work using the projection transformation method can also be done by means of nomographs as an alternative. Nomographs can be designed based on equations used for projection transformation. This paper describes how to design and apply nomographs in constructing the basic views of the feature of the machine elements with oblique planes.

AUTHOR: OUYANG Yi [2962 7122 3015]
ZHU Tonghua [2612 2717 5478]
WU Zonghan [0702 1350 3352]
LU Minqiang [4151 3046 1730]

ORG: All of Nanjing Institute of Technology

TITLE: "Analysis of Thermally Stimulated Current Due to the Excess Charge in Film Electret"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 2, 1981 pp 111-119

TEXT OF ENGLISH ABSTRACT: In this paper, the mechanism of TSC (thermally stimulated current) due to the excess charge in film electret is described, and an analytical expression for the TSC is derived.

We suggest that the TSC due to the excess charge is mainly caused by the diffusion of carriers across the zero-field-intensity surface. From this point of view the quantitative relationship between TSC and the transport of carriers in the electret is established, and an explanation of the low efficiency of TSC is obtained.

Experiments designed according to the above point of view showed that the TSC experiment may be carried out without golden coating on the sample, which is a fact of vital importance for an electret film 10 μm thick.

9717
CSO: 4009/415

AUTHOR: ZHU Bolong [2612 0130 7897]
ZHANG Kunlian [1728 3824 5114]

ORG: Both of Tongji University

TITLE: "A Study of Restoring Force Characteristics of Reinforced Concrete Flexural Members with a Constant Axial Load"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 1-10

TEXT OF ENGLISH ABSTRACT: This paper describes the experimental works of restoring force characteristics of reinforced concrete flexural members with a constant axial load. Based on experimental data of 35 specimens with rectangular or hollow circular sections, a model of restoring force used in inelastic analysis for earthquake responses of building structures, chimneys and TV masts was developed.

AUTHOR: CHEN Xuechao [7115 1331 3390]
JIN Ruichen [6855 3843 2797]
LIU Yongren [0491 3057 0088]

ORG: All of Tongji University

TITLE: "The Analysis of Deformations and Stresses in Pressurized Vessel for a Nuclear Reactor"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 11-25

TEXT OF ENGLISH ABSTRACT: The pressurized vessel of a nuclear reactor consists of three parts: the top cap, the ribbed tube-plate and the shells (the external shell and the bottom shell). This paper deals with the determination of deformations and stress states of the structure under the application of mechanical forces and the temperature fields by means of the finite element (high-order element) displacement method. A comparison especially for the ribbed tube-plate has been made between the results obtained by the finite element (both the high-order element and the simple element) method and those from the experiments.

The authors have worked out the general program for computing the deformations and stresses in some composite structures. A number of computations have been made with the SIEMENS-7730 type digital computer for different structure forms, sizes

[Continuation of TONGJI DAXUE XUEBAO No 2, 1981 pp 11-25]

and boundary conditions. These results are satisfactorily compared with those from the finite element (simple element) displacement method, experiments and classical solutions. The proposed program can be widely applicable to a lot of problems, such as plates, shells, beams and masts of single-type structures and composite structures under different mechanical forces and temperature fields.

AUTHOR: FU Changsheng [2105 7022 3932]
YU Zaidao [0205 6528 6670]

ORG: Both of Tongji University

TITLE: "A Preliminary Study of the Dynamic Behavior of the Soil-structure Interface"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 26-39

TEXT OF ENGLISH ABSTRACT: In most of the analyses of the soil-structure interaction problems, usually two extreme assumptions are made, i.e., the interface is so smooth that no shearing stresses could be transmitted, or it is so rough that soil and structure would be a perfect continuum. However, relative displacements on both sides of the interface will eventually take place in the process of transmitting forces.

In this paper such a case as is mentioned above is studied by introducing the so-called joint element. The primary conclusion we have arrived at is that the horizontal relative displacements have great influences only on the term corresponding to the translational modal shape in the dynamic stiffness matrix of the soil.

AUTHOR: GUAN Shilin [7070 0013 2651]
ZHANG Qinzhi [1728 3830 5347]
YAN Deyue [7346 1795 1471]
TANG Xinyi [3282 1800 7328]

ORG: All of Tongji University

TITLE: "On Random Degradation of Linear Polymer"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 40-48

TEXT OF ENGLISH ABSTRACT: During the course of random degradation of linear polymers, the number of scissions of the individual polymer chain in the system is different. In this paper, the authors treat the distribution of chain scissions by means of statistical mechanics and obtain the most probably distribution function in analytical form. Based on Mejziler's equation and aided by electronic computer data, the influences of MWD, distribution width, average degree of polymerization and average number of scissions of the initial polymer on MWD of random degradated polymer are discussed.

AUTHOR: XIONG Bingkun [3574 3521 3540]

ORG: Tongji University

TITLE: "Generalized Tellegen's Theorem for the One-port Network and Its Equivalent Network"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 49-57

TEXT OF ENGLISH ABSTRACT: In this paper the author discusses the power relationships between the one-port network and its equivalent network under any exciting sources by means of generalized Tellegen's Theorem. Two extended forms of Tellegen's Theorem and derived formulas with definite concept are obtained. At the same time, some computation rules of power relationships between the one-port network and its equivalent network previously reported by the author are once more proved simply with the results from this paper.

AUTHOR: HUANG Liede [7806 3525 1795]

ORG: Tongji University

TITLE: "The Existence and Uniqueness Theorems of the Linear and Nonlinear Hilbert Boundary Value Problems in Space"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 58-71

EXCERPT FROM ENGLISH ABSTRACT: This paper studies the linear and nonlinear Hilbert boundary value problems in space proposed by A.V. Bitsadze, who only solved the condition of the constant coefficient. The author first demonstrates that $H(\vec{\phi}, \Sigma)$ is Banach space, then uses Banach's fixed point theorem to demonstrate the existence and uniqueness of the variable coefficient solution for the linear Hilbert boundary value problem in space. At the same time he uses Schauder's fixed point theorem to demonstrate the existence of a solution for the nonlinear Hilbert boundary value problem in space, and that this solution, given the proper conditions, is also unique.

AUTHOR: SUN Zongjian [1327 1350 1696]

ORG: Tongji University

TITLE: "The Characteristics of Acousto-optic Diffraction for Plane-polarized Light"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 72-78

TEXT OF ENGLISH ABSTRACT: The characteristics of acousto-optic diffraction for plane-polarized light differ from those for non-polarized light, even in isotropic materials. The difference between two elasto-optic constants, P_{11} and P_{12}, of an isotropic material makes the characteristics of a-o diffraction for acoustic longitudinal and transverse waves transmitted in it different. In this paper, the analysis and experiments for the relation between the polarized direction of incidental light and the intensity, and the polarized direction of diffracted light are presented. Fused silica, which has a larger difference between P_{11} and P_{12}, and glass ZF_6, which has a smaller difference between P_{11} and P_{12}, are tested. The results from experiments are in accordance with the analysis.

AUTHOR: WANG Jiqing [3769 1323 0615]

ORG: Tongji University

TITLE: "An Experimental Study on Sound Transmission Loss of Lightweight Panel-stud Partitions"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 79-91

TEXT OF ENGLISH ABSTRACT: The sound insulation performance of a light panel-stud partition is greatly affected by its construction details. Since the construction parameters are very complicated, it is very difficult, if not impossible, to predict them by calculation.

After a series of experimental work in our sound insulation test facility, the following results are deemed valuable for practice: (1) TL for steel stud partition is higher than that for wood stud by an average of 4 dB. It is recommended that the depth and spacing of the stud should not be less than 7 cm and 60 cm respectively. (2) Addition of the first extra leaf to a two-leaf panel partition would improve the TL by 5-6 dB, but for another extra leaf only 2-4 dB. (3) Sound deadening fiber board strips between the stud and the panel on both sides would reduce the sound bridge effect, and then an improvement of TL of 3-6 dB for the steel stud partition is achieved, with an improvement of 6-9 dB for wood stud

[Continuation of TONGJI DAXUE XUEBAO No 2, 1981 pp 79-91]

partition. (4) Acoustical fiber bat in cavity would improve the TL by 5 dB for steel stud partition, and 8 dB for wood stud partition. However, only a small improvement, approximately 2 dB per leaf, could be gained by adding an extra leaf. (5) Since the effects of the above measures are not simply additive, one should choose the propriety of construction carefully if a high TL partition is required.

AUTHOR: ZHANG Guanlun [1728 0385 0243]
FANG Yuan [2455 0337]

ORG: Both of Tongji University

TITLE: "An Analysis of How the Composite Aluminate Type Accelerator Affects the Behavior of the Hydration of Portland Cement"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 92-101

TEXT OF ENGLISH ABSTRACT: This article deals with the accelerating mechanism of the Composite Aluminate Type Accelerator when it is added to portland cement.

In the presence of $NaAlO_2$, the $Al_2(SO_4)_3$ and other electrolytes in the cement-accelerator-water system electrolyze and react rapidly with Al_2O_3, $Ca(OH)_2$ and other chemical components to form micro needle granular ettringite and an intermediate product, secondary gypsum. These new crystals bridge the cement particles and cross-link each other to form a crystalline network, and thus the portland cement sets quickly.

This article also discusses the effect of the accelerator on the strength development of hardened cement.

AUTHOR: SUN Yeyang [1327 2814 2799]
YU Andong [0151 1344 2639]
JIANG Lusun [5592 7120 3932]
et al.

ORG: All of Tongji University

TITLE: "Earthquake Responses of Shanghai Guest Hotel by Use of the Combined Member-Story Model"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 102-112

TEXT OF ENGLISH ABSTRACT: Some attainments have been achieved in the research work of earthquake responses of tall buildings by use of the method of direct integration in recent years in China. The combined member-story model analyzing inelastic earthquake response of tall buildings is presented and the corresponding program is worked out by the authors. Based on the combined member-story model, the internal forces and deformations of each member at arbitrary time, including the maximum values of the above data within the history of earthquake response, can be obtained under consideration of frame-shear wall interaction. The application of this method to the earthquake response in the design of the Shanghai Guest Hotel is described in this paper. The hotel is 27 stories high and is being constructed. It is one of the primary attempts to apply the method of time history

[Continuation of TONGJI DAXUE XUEBAO No 2, 1981 pp 102-112]

analysis to practical design of tall buildings in China. The dynamic analysis shows that there are some advantages of the method of direct integration by comparison with the current aseismic code of China, and that the combined member-story model is more beneficial than is the story model for practical design.

AUTHOR: ZHANG Xiuyun [1728 1485 0061]
HUANG Xueming [7806 1331 2494]

ORG: Both of Tongji University

TITLE: "Poultry Houses and Their Environment"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 2, 1981 pp 113-121

TEXT OF ENGLISH ABSTRACT: The modern poultry production creates optimum environment for the growth of chickens. According to the climate conditions of China, this article proposes dividing poultry houses into several climatic zones and improving the structure of the poultry houses so that the temperature in the houses meets the requirements of the chickens.

9717
CSO: 4009/403

AUTHOR: HE Guangqian [0149 1639 0051]
ZHANG Weiyue [1728 4850 1471]

ORG: Both of the Chinese Academy of Building Research

TITLE: "Analysis of Plates and Shells by the Semi-analytical and Semi-discretizing Method"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 129-140

TEXT OF ENGLISh ABSTRACT: In this paper a semi-analytical and semi-discretizing method for the moment theory analysis of elastic plates and shells is presented. Analytic solutions will first be derived which satisfy the relevant fundamental differential equations for all points within the boundaries of the plates and shells and various boundary conditions can be satisfied at suitably chosen discrete points of the boundary by the collocation method. The present method of analysis covers the solution of plates, elliptic paraboloidal shallow shells with unequal radii of curvature, cylindrical shells, shallow spherical shells as well as hyperbolic paraboloidal shallow shells. Numerical solutions for five different examples are also given in this paper. By the present method, the resulting matrix equation can be very easily formed and is of much lower order and takes less computer time. The final results can meet the precision deemed necessary for the design of plates and shells. In addition, it offers a better understanding of the features of the

[Continuation of GUTI LIXUE XUEBAO No 2, 1981 pp 129-140]

analytic solution as well as a good insight into the distribution of the internal stresses and deformations of the plates and shells.

AUTHOR: HE Fubao [0149 4395 0202]

ORG: Zhejiang University

TITLE: "The Finite Element Method for Thin-walled Elastic Curved Beams"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 141-157

TEXT OF ENGLISH ABSTRACT: In this paper, the stiffness matrices of thin-walled elastic curved beams of open and closed sections are given by the displacement method. The polynomial approach is chosen for the displacement model and the effect of temperature is considered. As for the thin-walled elastic curved beams of closed section, the author adopts the well-known Ullmanski's hypothesis. The linear element of the cross section has been utilized by the author to discuss the discrete computation of Saint Venant's torsional function in accordance with the rule of linear distributional approach. The author also presents an analysis different from Fujita-Yoshinobu's work.

AUTHOR: LI Kaitai [2621 7030 3141]
YUAN Jiaxiang [5913 1367 7534]

ORG: Both of Xi'an Jiaotong University

TITLE: "A Finite Element Analysis Based on the Modern Engineering Beam Theory"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 159-171

TEXT OF ENGLISH ABSTRACT: The finite element analysis based on the modern engineering beam theory is a simplified finite element method applied to the overall analysis of beam structures. The distinction of this method is that it reduces the elastic structure problem of thin-walled or thick-walled beams from the solution of a three-dimensional to simultaneous solutions of a two-dimensional and a one-dimensional system, and thus it largely economizes the capacity and time for computation. Since use of this computing system for static and dynamic analysis may be carried out effectually and economically, it is suitable for frequent use.

The paper describes the basic principle of this finite element method and recommends its application to the deformation analysis of heavy machine tool beam structure. The paper also expounds the authors' views on the basic principle of the method for dealing with the stiffening ribs in a beam.

AUTHOR: DING Haojiang [0002 3185 3068]
XU Bohou [1776 0590 0186]
CHEN Zhiping [7115 1807 1627]

ORG: DING and XU both of Zhejiang University; CHEN of Zhejiang Institute of Computational Techniques

TITLE: "Improvement of a Method for Establishing the Refined Element Stiffness Matrix"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 172-178

TEXT OF ENGLISH ABSTRACT: A scheme for improving the method of formulation of the refined element stiffness matrix developed by Desai and Abel is proposed. The first step of the scheme is to find the shape function, then express the strain by a complete polynomial of low degree and finally the stiffness matrix will be given in the partitioned form. A plate element with 18 degrees of freedom is taken as an example to illustrate the realization of the scheme.

AUTHOR: SONG Tianxia [1345 1131 7209]

ORG: Huazhong Institute of Technology

TITLE: "Optimal Analysis of the Composite Structure with Double Cylindrical Shells"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 179-188

TEXT OF ENGLISH ABSTRACT: A fruitful unconstrained optimization analysis of the composite structure with double cylindrical shells mentioned in previous articles has been made. In the course of optimization, not only is the hybrid penalty function induced, but a new interpolation for solving one-dimensional optimization problems is also developed.

The computer program proposed is applicable to the optimal analysis of ordinary structures.

AUTHOR: WANG Lei [3769 4320]

ORG: Hunan University

TITLE: "Finite Strip Method of Sine Series and Polynomial"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 189-203

TEXT OF ENGLISH ABSTRACT: The sine series and polynomial are used as the basic function of the ends of a finite strip. The simply supported, clamped or free (including elastic supported and elastic slope supported) ends can all form orthogonal system of triangular series. Thus the phenomenon that coupling occurs in all conditions except when the ends are simply supported is avoided. The application of the finite strip method is widened by using this method and the total stiffness matrix is made to appear as a band matrix.

AUTHOR: ZHANG Dechang [1728 1795 2490]

ORG: Northwestern Polytechnical University

TITLE: "On the Conditions of Instability for Distributed Parameter Systems with Time Lag"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 204-207

TEXT OF ENGLISH ABSTRACT: In this paper Chetaev's theorem of instability is extended to include distributed parameter systems with time lag, and the sufficient conditions of instability are discussed. The method used here is inspired by Razmukhin and has been used by the author in his investigation of instability for ordinary systems with delay. The application of the results obtained is illustrated with an example.

AUTHOR: YE Yugong [5509 5940 1872]

ORG: Institute of Mechanics, Chinese Academy of Sciences

TITLE: "The Response of Ring-stiffened Elastic Cylindrical Shell of Infinite Length to a Transverse Shock Wave"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 208-222

TEXT OF ENGLISH ABSTRACT: This method employs a simple, unstiffened uniform circular cylindrical shell as a "reference structure" and treats the ring stiffeners as "external" loadings on the uniform shell.

Based on the assumption of small perturbation, the coupled effect between the fluid and shell is considered. The real external loading on the shell is the sum of the pressure of the incident shock wave and the scattered waves. In order to avoid the difficulty in the direct inversion of the Laplace transformation, the "residual potential" method is used. The elastic response of the shell is obtained by a series in terms of all normal modes of oscillation of the structure, including both the non-extensional and extensional effects in all modes.

Calculation was made for two groups of data and curves were drawn from the calculated results, from which some useful conclusions can be reached. The equations derived in this paper can be reduced to be identical with some equations published by others.

AUTHOR: HUANG Yushan [7806 3768 3790]
LIU Xuehui [0491 7185 1920]
NI Huiling [0242 1920 3781]

ORG: All of Northwestern Polytechnical University

TITLE: "Overload Retardation Models of Fatigue Crack Growth"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 2, 1981 pp 257-268

TEXT OF ENGLISH ABSTRACT: In this paper eight overload retardation models of fatigue crack growth are reviewed. Their basic principles are treated and physical concepts are explained in detail.

A comparison has been made among the eight models with respect to the retardation mechanism, performance and ability to explain a variety of retardation phenomena. It is the authors' view that the Wheeler model can be conveniently used and the Matsuoka model has a clear physical meaning. Comments on the application of the retardation models to the estimation of the fatigue crack propagation life and the research on the retardation phenomena are also made.

9717
CSO: 4009/412

AUTHOR: QIN Xue [4440 1331]

ORG: None

TITLE: "New Trend in Industrial Control--the Central Dispersed Comprehensive Control System"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 7, 81 pp 14-15

ABSTRACT: Currently, the various control systems in China basically belong to the central control type, i.e. all the instruments of regulation, meters of indication and recording, switches, buttons, and keyboards of the operating processes are installed in the central control room. On the work sites, only transforming and executing devices are installed. In some plants, computers have also been adopted. Although most of the needs for automated production are met, the system has its shortcomings. For example, all test data must be sent to the central control room before they are sent to each executing instrument as control signals in an analog form. In this manner, the control circuits may be several tens to hundreds meters in length. There may easily be interference and noise to reduce the reliability of the control signals. Every little problem in the central control may also cause the entire plant to be out of function. In view of these and other problems and

[continuation of YIQI YU WEILAI No 7, 81 pp 14-15]

with the breakthrough in large scale integrated circuits, single chip microprocessors appeared in the 70's to create the condition for the central distribution type of control system. With a few microprocessors, there may be centralized information processing and dispersed control capabilities. The various on site, local control devices are linked with the central control room by a data communication cable, the information highway, sometimes measuring as long as 4.5 km. The operator, at the CRT display station, uses various selected standard software packages, modules, to carry out control functions in a question and answer form. Even those who have no knowledge of computer science can be operators. This central distributed type of automation is still new but it has already been extensively applied in foreign countries. With further improvement and perfection, it is expected to become suitable for the industrial production control of medium and small plants in the not very distant future.

AUTHOR: QU Huiwen [4234 2585 2429]
HAI Zhi [3189 5347]
ZHANG Motong [4545 2875 6639]
ZHU Huanyi [2612 2255 0034]

ORG: None

TITLE: "News in Instrumentation"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 7, 81 p 19

ABSTRACT: This paper contains the following 5 short items: (1) Microprocessor controlled plotter: A highly automatic equipment for making graphics, the HT-129M microprocessor controlled plotter has been made by the Xian Instrument Plant. It has been approved for small batch production. (2) Microcomputer learning machine: Based upon the FT-3400 learning machine of the USA, the Xian Instrument Plant and the Microcomputer Application Research Institute of Hefei Industrial University have made, through joint research, the microcomputer learning machine, It is made up of such components as a cassette taperecorder, an EPROM accessory box, a test board, a singal source output, etc. and is suitable for teaching mathematical logic, microcomputers, etc. in schools of higher education as well as for small scale research work. (3) Switch type DC/AC high voltage transducer. It is made by the Research Institute of Sonics Chinese Academy of Sciences to provide for the needs of DC current of special sonic devices of ships. It is of course also suitable

[continuation of YIQU YU WEILAI No 7, 81 p 19]

for DC current supply of automobiles, tractors, etc. (4) Spring earth pressure gauge: The YCX-21 spring earth pressure gauge, suitable for testing the pressure of various foundations has been successfully made through joint research by Shanghai Industrial Automation Instrument Research Institute and the Navigation Engineering Bureau Scientific Research Institute of the Ministry of Transportation. It has characteristics of continuous frequency output, stable zero point, small temperature discrepancy, and high reliability. It may be used for long term monitoring of the load condition of such permanent structures as dams, coal mine pits, underground tunnels, railway beds, harbor wharves, skyscrapers, etc. It has been certified and will be manufactured by Shanghai Automation Instrument Plant No 4 and Tianjin Construction Instrument Plant. (5) Enzyme labelled quantitative testing instrument: The 80-1 enzyme labelled quantitative test instrument is successfully made by Shanghai Biochemical Research Institute Chinese Academy of Sciences. It is a modernized analyzer for medical use. It is suitable for analysis and diagnosis of serum pathogens.

6168
CSO: 4009/474

AUTHOR: SONG Chongsen [1345 1504 2773]

ORG: Ironmaking Works, Wuhan Iron and Steel Company

TITLE: "A Discussion of Top and Bottom Regulations in Blast Furnace Operation"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: The main goal of top and bottom regulations in blast furnace operation is to gain control of the burden movement and ensure a rational distribution of gas flow in the furnace. The main problem is to maintain an optimal blowing condition in order to create a proper distribution of gas flow beginning from the hearth. Process regulation in the upper part of the furnace is also necessary to ensure correct gas flow distribution along the height and across the furnace.

The optimal blowing condition has been studied, making use of the "combustion intensity at tuyere" concept, in which more furnace configuration parameters are included than were in the past. Thus, a new method is provided to develop furnaces with larger diameters and lower shafts, with more and smaller tuyeres, and to establish the relationship between proper blowing and configuration parameters of the furnace.

AUTHOR: LIU Yuncai [0491 0061 1752]

ORG: Shoudu Iron and Steel Company

TITLE: "Bulk Quantity Coal Injection in Blast Furnace Practice"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 7-11

TEXT OF ENGLISH ABSTRACT: In practical operation of the No 1 blast furnace (576 m^3) of Shoudu Iron and Steel Company, bulk quantities of coal powder were injected under conditions of oxygen-enriched (4-5 percent) blast with a temperature above 1100°C. When the average injection rate of coal powder was up to 45.2 percent (or 279 kg coal powder per metric ton of iron), the heat value was still fully utilized.

This paper discusses the fact that the main role of the coal powder is to replace tuyere coke and that operating conditions of bulk quantity coal injection practice can prolong the melting period and improve obviously the utilization of gas energy. Low ash and low volatile coal is suggested when bulk quantity coal injection is applied.

AUTHOR: SUN Changti [1327 7022 1879]
LIN Gongwen [2651 0501 2429]
ZHAO Aihe [6392 1947 0735]

ORG: All of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "The Fractional Melting Phenomenon of Mold Powders for Continuous Casting during the Heating Process"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 12-16

TEXT OF ENGLISH ABSTRACT: In this paper it has been proved that mold powder mixtures for continuous casting show a fractional melting phenomenon during the heating process, and a method is put forward to judge the fractional melting tendency of mold powders for continuous casting. The tendency of fractional melting for different mold powders is different. Mold powders with higher fractional melting tendencies result in worse slab surfaces.

AUTHOR: SHANG Shinan [0794 0013 0589]
WANG Benzhi [3769 2609 1807]

ORG: Both of the Anshan Institute of Iron and Steel Technology

TITLE: "A Study of the Aerodynamics of Oxygen Roof Lance for Open-hearth Furnaces"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 17-24

TEXT OF ENGLISH ABSTRACT: Through laboratory study and practical measurement in oxygen roof lance practice of the open-hearth furnace, this paper gives a general description of the basic laws governing the flowing of oxygen in the cylindrical nozzle. The author also has derived a formula for calculating the flow rate similar to that for calculating the flow rate in the Laval nozzle, thus simplifying the calculation of the design of the lance cylindrical nozzle.

The oxygen jet from the cylindrical nozzle has strong shock waves, which make the jet stagnation pressure attenuate abruptly in the direction of the axis. To eliminate the strong shock waves in the jet, a kind of supersonic nozzle, the cylindrical-divergent nozzle, has been worked out in the course of the experiments. It is easy to fabricate this supersonic nozzle. This nozzle has been proved, by actual measurements, to be similar to the Laval nozzle as far as the characteristics of the oxygen jet are concerned. A brief introduction is also given to the performance and design of the nozzle in the paper.

AUTHOR: XU Shouguo [1776 1343 0948]

ORG: Northeast Institute of Heavy Machinery

TITLE: "The Study of the Parameters of Axial Adjustment for a 20-High Rolling Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 25-30

TEXT OF ENGLISH ABSTRACT: In employing 20-high rolling mill to roll steel strips and extra-thin strips, it is necessary to adjust the roll profile to get a quality product with uniform gauge and good shapes. In general, the methods of roll adjustment are of two kinds: radial adjustment and axial adjustment. This paper deals with the research on axial adjustment, the relationship between the requirements for axial adjustment and its related parameters in the process of rolling. According to the theoretical analysis and experimental study, the results obtained are as follows: take the intermediate rolls with tapered ends of the first series as the axial adjustment roll, in the process of rolling, under the condition of non-total friction of rest (only under this condition). It is practical to make the roll move along the axial direction, to get the roll profile changed, and then achieve the axial adjustment under a load, and determine as well the relationship between the speed of axial adjustment and the parameters of axial force, radial force and rolling speed, etc.

AUTHOR: WANG Tingpu [3769 1694 3302]

ORG: Northeast Institute of Technology

TITLE: "Theoretical Formulas for Calculating the Maximum Reduction in the Case of Sheet Rolling Between Rolls of Unequal Diameter"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 31-35

TEXT OF ENGLISH ABSTRACT: In this article theoretical formulas for calculating the maximum reduction in the case of sheet rolling between rolls of unequal diameter with or without tension are derived from the principle of energy conservation. The results calculated from these formulas are similar to the maximum reduction determined from the condition of nip angle, and are essentially consistent with the experimental results. When the diameters of two work rolls are equal to each other, these formulas then become the same as those derived from maximum nip angle in the commonly symmetrical rolling process. It is evident from these formulas as well as the experiments that the difference between front tension (σ_1) and back tension (σ_0) has a strong influence on the maximum reduction (Δh_{max}). When $\sigma_0 > \sigma_1$, Δh_{max} is decreased, whereas greater front tension ($\sigma_1 > \sigma_0$) will make Δh_{max} greatly increased. Consequently, in order to increase the maximum reduction in the unsymmetrical rolling process, a high enough front tension must be applied.

AUTHOR: LI Songtang [2621 2646 1016]
GE Ruzheng [5514 3067 1073]

ORG: LI of the Design Institute of Anshan Iron and Steel Company; GE of the Automation Research Institute, Anshan Iron and Steel Company

TITLE: "The Relationship between Acceleration and the Control of Final Temperature of Hot Strip Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 36-41

TEXT OF ENGLISH ABSTRACT: The accelerative rolling schedule has been applied to the modern hot strip mill in order to keep a constant final temperature of the hot strip and improve the mill yield. All modern hot strip mills are equipped with accelerative devices with maximum acceleration of 0.5 - 1.0 m/sec^2 and minimum acceleration of 0-0.25 m/sec^2. It has been proved that lower acceleration is even more useful. In order to keep a constant final rolling temperature the mill must operate with acceleration in the range of 0.05 - 0.125 m/sec^2, thus successfully making the final thickness of the strip more uniform in the whole length.

This paper discusses the method of determining the lower acceleration rate and solves the problem of how to eliminate the temperature difference between the leading and tail of the strip with lower acceleration. When the old mill is remodeled, recommendations should be made for utilizing limited acceleration in order to obtain approximately constant final rolling temperature of the strip.

AUTHOR: ZHONG Yixiu [6945 2184 4423]
GAO Yinlu [7559 6892 7216]
ZHAO Zhonghui [6392 6945 2585]
QIU Zhiren [6726 1807 0088]
SONG Xinyu [1345 2450 3768]

ORG: ZHONG and GAO both of the Central Iron and Steel Research Institute; ZHAO of Daye Steel Works; QIU and SONG both of Luoyang Research Institute of Bearings

TITLE: "The Dependence of Bearing Life on the Quality of Bearing Steels"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 42-48

TEXT OF ENGLISH ABSTRACT: Bearing steels melted by five different processes, i.e., ESR, EBR, VAR, VIM-ESR and ESR-VAR, are compared in order to improve the quality and fatigue life of airborne bearings.

Based on the results of the analysis of ingot sections, conventional material testing, test of fatigue life performed on actual bearings, observation of fatigue fracture of broken bearings, the relationship between melting process, metallurgical quality and fatigue life of bearings has been discussed. It is concluded that inclusions are the main metallurgical factors affecting the life of bearings, especially the brittle oxides which have the most detrimental effect on fatigue

[Continuation of GANGTIE No 6, 1981 pp 42-48]

life. However, sulfides or oxides enveloped by sulfides have no detrimental effect on fatigue life. The amount of oxide inclusions and Al_2O_3 can be decreased by vacuum melting. Therefore, application of vacuum melting is one of the important measures for improving the fatigue life of bearing steels.

AUTHOR: SHI Xuan [2457 3872]

ORG: Beijing University of Iron and Steel Technology

TITLE: "Study of the Quality of Electroslag Casting and the Surface Forming Rules"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 6, 1981 pp 49-56

TEXT OF ENGLISH ABSTRACT: This paper describes the qualities, properties, service life, metal yield as well as cost and other technical characteristics of shaped electroslag casting--guide-wheel shafts and cross rolls. In comparing the test results, ESC is equivalent or superior to forged parts. Production practice in the last three years has also proved that the ESC direct forming process in which refining and casting are combined with forming is an important method for producing some billets of machine parts by casting instead of forging. Test results show that the improvement in interior qualities of ESC is mainly due to steel-slag refining reaction and longitudinal solidification by intensive cooling. The more complex the shape of ESC, the more difficult to get good surface forming. In this paper, factors and rules affecting surface forming are studied, and it is shown that the power value of specific volume of slag pool p_V is the main factor influencing the furnace temperature and surface forming. By statistics, the approximate relation between p_V and casting radius r is obtained, i.e., $1/p_V = 3(r-2)$.

9717
CSO: 4009/408

AUTHOR: LI Guoping [2621 0948 1627]

ORG: Department of Physics, Shanghai Teachers College

TITLE: "Non-equilibrium Steady State in Three-energy-level Laser System"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 7, Jul 81 pp 1-5

TEXT OF ENGLISH ABSTRACT: Taking energy and entropy as the main parameters, the changing process and dissipative properties of a laser system both with and without outside influence are considered. With the help of the principle of minimum entropy production, we introduce the phenomenological linear law to explain quantitatively the relations among the stimulated radiation, the stimulated absorption and the photon number density inside the cavity and to seek the thermodynamic criterion of the steady state of a laser under entropy and energy flux exchange with the environment.

AUTHOR: LEI Shizhan [7191 0099 3277]
ZHOU Zhongyi [0719 1813 4135]

ORG: Both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Influence of Gas Lens-like Effect on Mode-locking of TEA CO_2 Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 7, Jul 81 pp 7-10

TEXT OF ENGLISH ABSTRACT: The change of longitudinal frequency spacing produced by gas lens-like effect has been calculated and mode-locking induced by this change is discussed. To make gas flow or to add more He gas into the mixture so as to reduce the lens-like effect, it is possible to obtain mode-locked narrower pulses. Using proper laser resonator configuration, mode-locking stability can also be improved.

AUTHOR: GUAN Tieliang [7070 6993 2733]
HE Yuquan [0149 6877 3123]

ORG: Both of the Southwest Research Institute of Applied Magnetics

TITLE: "Magneto-optic Isolator for Optical Fiber Transmission"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 7, Jul 81 pp 11-14

TEXT OF ENGLISH ABSTRACT: The investigation of a magneto-optic isolator for fiber communication is reported. The isolator consists of a Faraday rotator made of rare-earth iron-garnet single crystal and two calcite prisms. Insertion loss of 2.4 db and isolation ratio of 34.8 db were obtained at 1.15 μm wavelength. The improvement of isolator properties by using some rare-earth substituted iron-garnets and polarization-independent techniques are also discussed.

AUTHOR: ZHAO Yeying [6392 8518 5391]
MEI Jiafu [2734 1367 4395]

ORG: ZHAO of the Shanghai Institute of Laser Technology; MEI of the Shanghai Institute of Ship Research

TITLE: "Double Speckle Interferometry"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 7, Jul 81 pp 25-27

TEXT OF ENGLISH ABSTRACT: In the paper, we analyze the disturbance of out-of-plane displacement on in-plane displacement and suggest a new experimental method, "double speckle interferometry," to separate the displacement mentioned above.

9717
CSO: 4009/476

AUTHOR: LIANG Renqi [2733 0088 0967]

ORG: Shanghai Machine Tool Plant

TITLE: "Quickly Improving the Ability of Chinese Make Machine Tools to Compete on the International Market"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 6, 81 pp 2, 34

ABSTRACT: This paper carries a subtitle of "Some Personal Feelings After Visiting the Chicago International Exhibit of Machines." The author visited the 1980 biennial exhibit of 900 participating machine tool manufacturers of 30 countries of the world. Machine tools made in India, South Korea, and even the Chinese province of Taiwan may be found, but not those made in the continental China. In a booth set up by a intermediary commercial company of the USA, some milling machines and laths looked very familiar to the author, however, and he knew they were products of China, without doubt. The names of Chinese manufacturers were covered by the name of a foreign company, on these machines. From a foundation of nothing, the machine tool industry of China has developed in leaps and bounds in the past 3 decades, with a production volume now ranking among the first few in the world, but the export volume is only one-thousandth of the world market. So far, Chinese machine tools have been made mainly to supply the needs of domestic economic construction. Aside from design and quality, in order to occupy a proper place in the world market, the paper suggests

[continuation of JIXIE ZHIZAO No 6, 81 pp 2, 34]

that (1) Market surveys should be carried out so that safety regulations and technical standards of various countries as well as their needs for various types of machine tools may be understood; (2) Attention should be given to the quality of advertisement; (3) The work of customer relations should be strengthened; (4) More attention should be given to customer service, such as maintaining a file of supply, repair, and maintenance conditions, helping customers installing, testing, or even training operators and repair technicians.

AUTHOR: SUN Xiancheng [1327 6343 2052]
JIANG Jianzhong [5592 1696 0022]
FENG Kaidi [7458 0418 2769]
KANG Guoqiang [1660 0948 1730]

ORG: All of Shanghai Machine Tool Plant No 2

TITLE: "The T6920 Ultraheavy Boring-Milling Machine With Easy Numeric Control of Positioning"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 6, 81 pp 3-4

ABSTRACT: The T6920 ultraheavy boring-milling machine, designed and made by Shanghai Machine Tool Plant No 2, has been officially operated by Shanghai Steam Turbine Plant since Dec 79 to process large parts with satisfactory results. The machine measures, externally, 20700 x 7930 x 10100mm and weighs 220t. The diameter of the major axle is ϕ200mm and that of the milling axle is ϕ320mm. The major axle rotates at a speed of 1.5-400r/min. The machine has 2 position control coordinates and one coordinate for simultaneous control. The driving component consists of an ordinary Z_2DC motor of silicon controlled stepless variable speed. The machine still has problems with respect to sealing of the guide track, designing of the cover, etc. Moreover, it has not been long since it was placed in operation. Its true industrial and practical value remains to be assessed in the future.

AUTHOR: None

ORG: Shanghai Machine Tool Plant No 8; Department of Business Administration, Shanghai Machine Tool Company

TITLE: "The D7125 Electri Spark Forming Machine"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 6, 81 p 48, front cover

ABSTRACT: The D7125 electric spark forming machine is a recently successfully tested new product of the Shanghai Machine Tool Plant No 8. It was certified in Dec 80 by a conference organized by Shanghai Municipal Machine Tool Company and composed of representatives of related research institutes, special colleges, and factories. The machine is small, reliable, and highly automated. Its major indices are comparable to the advanced levels of similar domestic and foreign products. It is suitable for machining molds or holes of complex shapes or cavities. The major characteristics and specifications of the machine are described. A photo of the machine is on the front cover of this issue.

6248
CSO: 4009/471

AUTHOR: YU Ying [0205 3853]
LIN Meiqiong [2651 5019 8825]
FAN Xianhua [5400 7359 5478]

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences, Beijing

TITLE: "The Separation of Technetium from Acidic High Level Radioactive Liquid Waste by the Use of Extraction Resin Carrying Tetraamine 7402"

SOURCE: Beijing HE HUAXUE YU FANGSHE HUAXUE [JOURNAL OF NUCLEAR AND RADIOCHEMISTRY] in Chinese Vol 3 No 3, Aug 81 pp 141-148

TEXT OF ENGLISH ABSTRACT: The separation and recovery of technetium from acidic high-level radioactive liquid waste after denitration by formic acid has been studied using extraction resin carrying tetraamine 7402, which was prepared by means of suspension polymerization at 80°C of styrene crosslinked with divinyl benzene in the presence of 7402 extractant.

The feed, a simulated solution of high level liquid waste from reprocessing of spent fuel, was passed through the column after it had been denitrated by formic acid to a pH value of 2. By means of partial adsorption of technetium on the extraction resin and eluting with nitric acid, decontamination factor from γ-fission element, Ru, Cs and Ce of 1×10^5, $\geqslant 2 \times 10^5$, $\geqslant 1 \times 10^5$ respectively, could be obtained after two cycles of operation, and technetium could be recovered quantitatively.

[Continuation of HE HUAXUE YU FANGSHE HUAXUE Vol 3 No 3, Aug 81 pp 141-148]

The method is simple and easy to operate, and the use of precious Ag-metal can be avoided. The use of extraction resin instead of liquid-liquid extraction also eliminated production of organic liquid waste in the process, thus simplifying waste treatment.

AUTHOR: LIN Fa [2651 4099]
YAN Shuheng [0917 0647 5899]
ZHANG Shulan [1728 3219 5695]

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences, Beijing

TITLE: "Separation and Determination of Rare Earth Elements in Fission Products by Pressurized Cation Exchange Chromatography"

SOURCE: Beijing HE HUAXUE YU FANGSHE HUAXUE [JOURNAL OF NUCLEAR AND RADIOCHEMISTRY] in Chinese Vol 3 No 3, Aug 81 pp 155-161

TEXT OF ENGLISH ABSTRACT: In the separation of rare earth elements with α HIBA-cation exchange chromatography, two gradient elution techniques, pH-gradient or concentration gradient, are usually used. It is considered that the two gradients are in fact both concentration gradients of α HIBA anion. For routine analysis a simple gradient device is preferred which consists of two identical cylindrical vessels and operates under nitrogen pressure. The mixing vessel contains 150 ml of 0.75 M HIBA solution at pH 2.50, and the reservoir vessel, 150 ml of 0.50 M α HIBA solution at pH 4.50. A stainless steel column (ϕ 4 x 500 mm) was filled with 2 x 8 cation exchange resin (20-30μm). During the elution at 80 ± 0.5°C, the flow rate was adjusted to 0.7 ml/min by regulating the pressure of nitrogen. Ten rare earth elements were completely separated within seven hours without cross contamination. The recovery for each rare earth element was above 95 percent.

[Continuation of HE HUAXUE YU FANGSHE HUAXUE Vol 3 No 3, Aug 81 pp 155-161]

The effect of four solutions for initial loading of the column on the band was examined: (1) The rare earth nitrates dissolved in 0.5 M α HIBA solution at pH 3.20. (2) The solution of rare earth nitrates adjusted to pH 3.0 - 3.5 with ammonium hydroxide. (3) The rare earth hydroxides dissolved in 0.5 M α HIBA solution at pH 3.20. (4) The rare earth nitrates dissolved in dilute HNO_3 solution at pH 2.5 - 3.0. The experimental results indicated that the fourth solution for initial loading of the column is the best. Maximum rare earth concentration occurred on the top of the column, and the adsorbed band is narrower. Better results could be obtained from the first solution, but the rare earth precipitates were sometimes separated out from the solution after dissolving. Based on the abovementioned facts, a procedure was proposed to separate and determine individual rare earth radioactive nuclides from the fission products, and good results were obtained when it was applied for determination of the fission yields of the rare earth nuclides.

AUTHOR: None

ORG: Division of Radiochemistry, Northwestern Institute of Nuclear Technology

TITLE: "The Determination of the Amount of Residual Plutonium-239 in the Nuclear Explosion Debris"

SOURCE: Beijing HE HUAXUE YU FANGSHE HUAXUE [JOURNAL OF NUCLEAR AND RADIOCHEMISTRY] in Chinese Vol 3 No 3, Aug 81 pp 173-179

TEXT OF ENGLISH ABSTRACT: The amount of residual plutonium-239 in the nuclear explosion debris was determined by mass spectrometric and alpha spectrometric analyses. The error caused by the influence of neptunium-239 on the determination of plutonium-239 was corrected by direct subtraction or linear extrapolation. A radiochemical analytical procedure was proposed and a method for storing the plutonium isotopic diluent of very low concentration (10^{-9} M) was recommended. An error less than ± 5 percent could be obtained for the direct subtraction method which is applicable only when the total yield of uranium-239 is small, and when using this method the uranium and neptunium must be separated from plutonium as early as possible. The error of the linear extrapolation is generally less than ± 4 percent, and this method is superior to the former one when the total yield of uranium-239 is large.

9717
CSO: 4009/472

AUTHOR: ZHU Jieqing [2612 4634 3237]
LE Anquan [2867 1344 0356]

ORG: Both of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "An Alpha Particle Thickness Gauge by Air Equivalent Method"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 4, Aug 81 pp 20-26

TEXT OF ENGLISH ABSTRACT: An α -ray thickness gauge has been designed for the purpose of measuring the thickness of ultra-thin foils ($0\sim4$ mg/cm^2) made of any material. The precision is better than 1.5 percent. By using the air equivalent method, it is possible to measure samples in the air to simplify the instruments used and to obtain higher precision. A semi-empirical formula for the relative mass stopping power as a function of E_α , Z and A has been derived. The divergency between the results from the formula and the data from Ziegler's table is less than 8 percent.

AUTHOR: GAO Mili [7559 4717 0500]
ZHONG Daming [6945 1129 2494]
SUN Liting [1327 4539 0080]
et al.

ORG: All of the Shandong Institute of Medical Research

TITLE: "The Fluorescence Analysis of Uranium in Phosphate Fertilizers, Soils and Plants"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 4, Aug 81 pp 53-56

TEXT OF ENGLISH ABSTRACT: Trace uranium in plants, soils and phosphate fertilizers was determined with the method of fluorescence analysis. The recovery of the procedure for 1 μg of added uranium is 74 percent. The detection limit of the fluorophotometer is 5×10^{-10} g, with a precision of 5 percent. The sensitivity of the method is 7.5×10^{-9} g for 1 g of plant ash, 6.4×10^{-9} g for 1 g of soil, and 1.2×10^{-8} g per g for 0.1 g of phosphate fertilizer. The time required for determining three parallel samples is about six hours.

9717
CSO: 4009/477

AUTHOR: QIAN Xiangrong [6929 4382 2837]

ORG: Shanghai Institute of Iron and Steel Research

TITLE: "Neutron Diffraction Study of the Order-Disorder Transition of an Fe-Si-Al Alloy"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 7, Jul 81 pp 887-894

TEXT OF ENGLISH ABSTRACT: The degrees of LRO (long range order) and magnetic moments of the Fe atoms in an Fe-Si-Al alloy have been determined by neutron diffraction. The results indicate that after heat treatments with different cooling rates, the alloy gains different degrees of LRO, which may be regarded as the main cause giving rise to significant differences in the magnetic permeability.

AUTHOR: FAN Haifu [5400 3189 4395]
HAN Fusen [7281 4395 2773]
HE Cunhang [6320 1317 1854]

ORG: FAN and HAN both of the Institute of Physics, Chinese Academy of Sciences; HE of the Chinese Academy of Medical Sciences

TITLE: "On the Application of Heavy Atom Information in Direct Methods--Phase Estimation of the Structure Factors in Crystals Containing Heavy Atoms"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 7, Jul 81 pp 916-920

TEXT OF ENGLISH ABSTRACT: Information drawn from the heavy atom plays an important role in the determination of crystal structures containing heavy atoms. To what extent the determination will proceed successfully depends on how the heavy atom information is used. In this paper a new procedure is proposed to make full use of the heavy atom information and make the combination between the heavy atom method and the direct method more efficient.

9717
CSO: 4009/460

END

JPRS 79148

6 October 1981

China Report

SCIENCE AND TECHNOLOGY

No. 130

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79148

6 October 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 130

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

PUBLICATIONS

Table of Contents of 'WUHAN SHUILI DIANLI XUEYUAN XUEBAO,' No 2, 1981.. 1

Table of Contents of 'SHUZHI JISUAN YU JISUANJI YINGYONG,' No 2, 1981.. 3

Table of Contents of 'QINGHUA DAXUE XUEBAO,' No 2, 1981................ 4

Table of Contents of 'HUNAN YIXUEYUAN XUEBAO,' No 2, 1981.............. 6

Table of Contents of 'CHONGQING DAXUE XUEBAO,' No 2, 1981.............. 10

Table of Contents of 'CUIHUA XUEBAO,' No 2, 1981....................... 12

Table of Contents of 'HUAXUE XUEBAO,' No 3, 1981....................... 14

Table of Contents of 'SHUXUE XUEBAO,' No 4, 1981....................... 17

Table of Contents of 'GAONENG WULI YU HE WULI,' No 4, 1981............. 19

Table of Contents of 'SHUIWEN DIZHIGONGCHENG DIZHI,' No 4, 1981........ 22

Table of Contents of 'QUICHE JISHU,' No 6, 1981........................ 24

Table of Contents of 'HUAXUE TONGBAO,' No 7, 1981...................... 26

Table of Contents of 'HUAXUE TONGBAO,' No 8, 1981...................... 28

[III - CC - 84]

ABSTRACTS

ARMAMENTS

BINGGONG XUEBAO [ACTA ARMAMENTARII], No 3, Aug 81...................... 30

COAL

ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY], No 2, 25 Jun 81.. 32

ENGINEERING

QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY], No 3, 1981....... 33

GEOLOGY

DIZHI LUNPING [GEOLOGICAL REVIEW], No 4, 1981........................... 40

GEOPHYSICS

DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA], No 3, 1981................. 43

SEISMOLOGY

DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA], No 3, 1981................... 46

SEISMOLOGY AND GEOLOGY

DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY], No 3, Sep 81.................... 48

TABLE OF CONTENTS OF 'WUHAN SHUILI DIANLI XUEYUAN XUEBAO,' NO 2, 1981

Wuhan WUHAN SHUILI DIANLI XUEYUAN XUEBAO [JOURNAL OF THE WUHAN INSTITUTE OF HYDRAULIC AND ELECTRIC ENGINEERING] in Chinese No 2, 1981 inside back cover

[Text] On Rock Plug Blast of Fengman Hydroelectric Power Station and Its Influence on the Sluice Gate......Zhou Zuren [0719 4371 0088], Department of Water Conservancy Engineering; Fang Shanfeng [2455 1472 1496], Department of Building Structures (1)

Minimum Algorithm in Three-dimensional Finite Element...... Zhang Xueqin [1728 1331 0530] and Liu Tienan [0491 6993 3948], both of the Department of Hydro Construction (11)

The Method of Pressure and Speed-rise Computations for Turbines by Digital Computer......Zhang Shihua [1728 1597 5478], Hydroelectric Power Station Teaching and Research Group (19)

The Preliminary Analysis of Interflow......Liu Bingheng [0491 3521 5899], Water Resources Research Group, Water Conservancy and Hydroelectric Power Research Institute (29)

The Reduction of System Networks......Yuan Guangyu [5913 0342 5940], Department of Water Conservancy Engineering (35)

Heat Exchange Coefficient Under the Protection of Concrete Surface......Liang Run [2733 3387], Water Conservancy and Hydroelectric Construction Teaching and Research Group (45)

The Application of Shadow Matrix to the Organizing Program of Hydraulic Engineering Construction......Cheng Linzhi [4453 7792 6400], Mathematics Teaching and Research Group (53)

The Scour Calculation of Span of Bridge Grade on Clay Loam ......Zhu Bingxiang [2612 3521 4382], Fourth Survey and Design Academy, Ministry of Railways (59)

Error Analysis and Calculation in Efficiency Testing of Model Hydraulic Turbines......Lin Mingcan [2651 2494 3605] and Liu Zhongxian [0491 1813 6343], both of the Hydroelectric Power Station Driving Equipment Teaching and Research Group (69)

Analysis and Calculation under Rolling Mill Impact Load in Water Turbine Generator Unit......Liu Bingwen [0491 3521 2429], Hydrodynamics Teaching and Research Group (79)

Finite Element Solution and Net Simulation of Complex Medium Electric Fields at Sine Steady State......Dai Jiangjiang [2071 3068 3068], graduate student, Department of Electric Power (89)

The New Routh's Criterion of Static Stability of Complex Power Systems......Han Qiye [7281 0796 2814], graduate student, Department of Electric Power (99)

The Application of the REI Equivalent Method in Calculation of Transient State Stability of Power Systems......Zhao Zunlian [6392 6690 1670], graduate student, Department of Electric Power (105)

The Application of Unit-matrix and Diagonal-matrix Method in the Decoupling of a Two-variable Control System...... Liu Chenhui [0491 2525 2547], Electronic Technology Teaching and Research Group (109)

9717
CSO: 4008/437

PUBLICATIONS

TABLE OF CONTENTS OF 'SHUZHI JISUAN YU JISUANJI YINGYONG,' NO 2, 1981

Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 2, Jun 81 inside back cover

[Text] An Algorithm for Piecewise Linear Programming Problem......Zhao Fengzhi [6392 7685 3112], Computing Center, Chinese Academy of Sciences (65)

Spline Finite-points Method......Qin Rong [4440 2837], Guangxi University (68)

Application of Approximate Integration Theory to Turbomachinery Testing and Calculation......Zhang Chunlin [1728 2504 7207], 703 Institute (82)

A Direct Method of Computing the Moore-Penrose Inverse of a Matrix......Lin Yingju [2651 2019 5282], Computing Center, Nanjing University (94)

A Method for Solving Generalized Linear Least Squares to Fit Problem with Constraints......Zhou Liandi [0719 6647 4574], China Ship Scientific Research Center (98)

Statistical Simulation of Rarefied Gas Hypersonic Flow Passing Combinatorial Rotatory Bodies......Wu Zhenyu [0702 2182 1342], Department No 89956, PLA; Li Fenglin [2621 7685 2651], Computing Center, Chinese Academy of Sciences; Lin Baozhen [2651 0202 4176], Chinese Academy of Space Technology (105)

A Dynamic Block Pivotal Method for Large-scale Linear Programming......Wei Ziluan [7614 4793 7019], Computing Center, Chinese Academy of Sciences (114)

The Jacobi Method of Solving Eigenvalue Problem of a Real Symmetric Matrix......Deng Jianxin [6772 1696 2450], Computing Center, Chinese Academy of Sciences (122)

9717
CSO: 4008/439

PUBLICATIONS

TABLE OF CONTENTS OF 'QINGHUA DAXUE XUEBAO,' NO 2, 1981

Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 2, May 81 inside back cover

[Text] The Equations in Complex Variables under Axial Symmetric Loads and Their Asymptotic Solutions......Zhao Hongbin [6392 7703 6333], Wu Zhenhui [0702 2182 6540] and Shen Zhupei [3088 4371 1014], all of the Department of Engineering Physics (1)

A FORTRAN IV General Computer Program for Quantum Chemistry Ab Initio Calculation MQAB-80......Wu Guoshi [0702 0948 2508] and Liao Muzhen [1675 3092 4176], both of the Department of Chemistry and Chemical Engineering, Qinghua University; Liu Honglin [0491 3163 7207], Shanghai Institute of Metallurgy, Chinese Academy of Sciences (15)

An Investigation on Thermodynamics of Solvent Extraction of Metals (II) Calculation of Activity Coefficients for Quaternary System $(C_7H_{15})_2SO-C_6H_4(CH_3)_2-UO_2(NO_3)_2\cdot 2(C_7H_{15})_2SO-H_2O$......Cheng Zhenhua [4453 2182 5478], Teng Teng [3326 5671] and Li Yigui [2621 0110 0964], et al., all of the Department of Chemistry and Chemical Engineering, Qinghua University (27)

A General Purpose Circuit Analysis Program for Minicomputer-GCAPN......Hong Xianlong [3163 0341 7893], Wu Qiming [0702 0796 2494] and Sun Jiaguang [1327 1367 1639], et al., all of the Department of Computer Engineering and Science (43)

A New Method of Coordinate-transformation for the Three-axis Gyroscope-stabilized Platform--The Electronic Coordinate-transformer......Guo Zhongwei [6753 0112 0251], Department of Precision Instruments (55)

Integrated Optimal Control of Large Turbogenerator Set and Tests on Micro-alternator System......Lu Qiang [4151 1730], Wang Zhonghong [3769 0112 7703] and Han Yingduo [7281 5391 6995], et al., all of the Department of Electrical Engineering (63)

Angular Correlations in Cascade Decays of the Compound Nucleus......Chen Xuejun [7115 1331 0193], Department of Engineering Physics (79)

Application of the Pseudo-measurements for the Estimation-identification Approach of Multiple Bad Data......Xiang Niande [4161 1628 1795] and Wang Shiying [3769 0013 4964], both of the Department of Electrical Engineering, Qinghua University; Yu Erkeng [0060 1422 6972], Computer Application Laboratory, Electric Power Research Institute, Ministry of Electric Power (85)

A Method of Derivation of the Stress Equations for Slip-line Field in Plane Plastic Strain......Chen Sencan [7115 2773 3605], Department of Mechanical Engineering (97)

Some Problems in Real-time Application of the Estimation-identification Approach of Bad Data......Xiang Niande [4161 1628 1795] and Wang Shiying [3769 0013 4964], both of the Department of Electrical Engineering, Qinghua University; Yu Erkeng [0060 1422 6972], Computer Application Laboratory, Electric Power Research Institute, Ministry of Electric Power (101)

Contents of Science Report of Qinghua University, 1980...... (113)

9717
CSO: 4008/440

TABLE OF CONTENTS OF 'HUNAN YIXUEYUAN XUEBAO,' NO 2, 1981

Shaoyang HUNAN YIXUEYUAN XUEBAO [BULLETIN OF HUNAN MEDICAL COLLEGE] in Chinese No 2, 30 Jun 81 pp 93-94

[Text] Technology on Real-time Two-dimensional Echocardiography

Real-time Two-dimensional Echocardiographic Examination Technique and Normal Images......Li Weifang [2621 0251 5364], Zheng Qiyu [6774 0796 1342], Chen Ganren [7115 1626 0088], Chen Xieqing [7115 0588 7230], et al., all of the Second Affiliated Hospital, Hunan Medical College; Xu Huanli [1776 3562 0196] and Han Chengzhu [7281 2110 2691], both of the Department of Human Anatomy, Hunan Medical College (95)

Clinical Application of Real-time Two-dimensional Echocardiography......Zheng Qiyu [6774 0796 1342], Li Weifang [2621 0251 5364], Chen Xieqing [7115 0588 7230] and Chen Ganren [7115 1626 0088], et al., all of the Second Affiliated Hospital, Hunan Medical College; Han Chengzhu [7281 2110 2691], Department of Human Anatomy, Hunan Medical College (105)

Basic Medicine

The Last Contribution to the Four Modernizations by Professor H.S. Chen......The Editorial Board (124)

A Report on the 10th International Congress on Tropical Medicine and Malaria......Chen Huxin [7115 4375 9515; deceased], Parasitology Teaching and Research Group, Hunan Medical College (125)

Detection of EB Virus Specific IgA Antibody from Patients with Nasopharyngeal Carcinoma by Immunoenzymic Method...... Wu Jieru [0702 3381 1172], He Fangli [0149 2455 7787] and Shi Kai [2457 0418], all of the Department of Microbiology, Hunan Medical College; Zhang Haiqing [1728 3189 3237] and Jiang Xinwei [5592 2450 0251], both of the ENT Department, Second Affiliated Hospital, Hunan Medical College (128)

A Preliminary Study of Receptors of the Positive Inotropic Effects of N-Methyltyramine, an Active Principle of Zhishi (*Citrus aurantium*)......Yan Youfang [0917 1635 5364] and Zhong Huiping [6945 1979 1627], both of the Department of Pharmacology, Hunan Medical College (131)

Preliminary Study of Serum Immunoglobulin Level of Healthy Adults in Changsha District......Wang Jigui [3769 4949 6311] and Yang Xilan [2799 6932 5695], both of the Second Affiliated Hospital, Hunan Medical College (135)

Clinical Medicine

Supratemporial Route for Extirpation of Acaustic Tumor......Wang Maoshan [3769 5399 1472], Department of Neurosurgery, First Affiliated Hospital, Hunan Medical College (138)

A Study of the Problems in the Diagnosis of Vitamin D Deficiency Rickets in Infancy......Ye Yiyan [5509 5030 6056], Zhao Xiangwen [6392 4382 2429] and Wu Zhongkuang [0702 0022 0562], all of the Department of Pediatrics, First Affiliated Hospital, Hunan Medical College (141)

Clinical Study of Acute Purulent Pericarditis in Children with a Report of 63 Cases......Yan Shufang [0917 3219 5364], Xiong Zhengdong [3574 2973 2639] and Wang Xiaoli [3769 2556 7812], all of the Pediatrics Teaching and Research Group, Second Affiliated Hospital, Hunan Medical College (146)

A Family Report of Hereditary Congenital Zonular Cataract ......Kang Jieyuan [1660 0094 0337] and Du Daixue [2629 1486 7185], both of the Department of Ophthalmology, First Affiliated Hospital, Hunan Medical College (149)

A Discussion of Prevention and Treatment of Senile Chronic Bronchitis Based on 42 Dead Cases......Prophylactic and Therapeutic Group of Chronic Bronchitis, First Affiliated Hospital, Hunan Medical College (152)

Postpartum Cardiomyopathy......Wang Zhonglin [3769 6945 2651], Internal Medicine Department, Second Affiliated Hospital, Hunan Medical College (155)

Classification of Acute Nonlymphocytic Leukemia--Analysis of 54 Cases......Su Xuezhang [5685 1331 4545], Chen Mengjun [7115 1322 0689] and Rao Xuehui [7437 1331 6540], et al., all of the Second Affiliated Hospital, Hunan Medical College (158)

The Dendrolimus Disease in Changsha

Survey of the Disease Caused by Dendrolimus punctatus in Yuelu Park, Changsha......Lu Zongmeng [7120 1350 1322], Liu Zuzhan [0491 6398 1455] and Wu Zhengyuan [0702 1767 6678], all of Hunan Medical College (161)

The Dendrolimus Disease in Changsha--A Report of Identification of Its Pathogen and Human Experiment......Feng Dichao [7458 2769 2600] and Xie Changsong [6200 7022 2646], both of the Parasitology Teaching and Research Group, Hunan Medical College (164)

Clinical Analysis of 333 Cases of Dendrolimus Disease...... Wu Zhengyuan [0702 1767 6678], Mo Yu [5459 3254], Yan Shufang [0917 3219 5364], et al., all of the Department of Pediatrics, Second Affiliated Hospital, Hunan Medical College (167)

Effects of Ultraviolet Rays on the Pain and Swelling Caused by Dendrolimus Disease......Department of Physicotherapeutics, Second Affiliated Hospital, Hunan Medical College (171)

Case Report

Use of the Lower Lip Flap in Secondary Repair Deformity of Bilateral Cleft Lip......Deng Fangcheng [6772 5364 2052] and Shen Zihua [3088 1311 5478], both of the Stomatology Section, First Affiliated Hospital, Hunan Medical College (172)

Aneurysmal Bone Cyst of the Vertebra--A Report of Two Cases ......Wang Chongwu [3769 1504 2976], Orthopedics Department, First Affiliated Hospital, Hunan Medical College; Wang Huanshen [3769 3562 3947], Radiology Department, First Affiliated Hospital, Hunan Medical College (175)

A Rare Case of Left Superior Vena Cava......Liu Lihou [0491 6849 0230] and Zeng Zhicheng [2582 1807 6134], both of the Local Dissection and Surgical Operations Teaching and Research Group, Hunan Medical College (177)

A Case Report of Tertian Malaria with Clinical Manifestation of Acute Thrombocytopenic Purpura......Ji Biao [4764 2871], Infectious Diseases Department, First Affiliated Hospital, Hunan Medical College (178)

Proliferating Brenner Tumor of the Ovary and Cancer of the Bladder......Xu Shuyuan [6079 3219 1254] and Liang Yingrui [2733 5391 6904], both of the Pathology and Dissection Teaching and Research Group, Hunan Medical College; He Fangding [6320 2455 1353] and Zou Jinglian [6760 7234 5571], both of the Obstetrics Department, First Affiliated Hospital, Hunan Medical College (179)

A Case of Spontaneous Cholecystogastric Fistula with Gallstones in the Gastric Wall......Wu Hainan [0124 3189 0589], et al., all of the Pathology Department, Second Affiliated Hospital, Hunan Medical College (181)

A Case of Giant Retroperitoneal Lipoma......Xue Qiming [5641 0796 2494] and Huang Fupu [7806 4395 3302], both of the Department of Urology, First Affiliated Hospital, Hunan Medical College (183)

Pneumatosis Cystoides Intestinalis--A Case Report......Yin Deying [3009 1795 5391], Department of Internal Medicine, Second Affiliated Hospital, Hunan Medical College (184)

Review of Literature

Infectious Diseases and Hypoglycemia......Qian Binggui [6929 3521 0964], Infectious Diseases Department, First Affiliated Hospital, Hunan Medical College (186)

9717
CSO: 4008/442

PUBLICATIONS

TABLE OF CONTENTS OF 'CHONGQING DAXUE XUEBAO,' NO 2, 1981

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY] in Chinese No 2, 1981 preceding p 1

[Text] From the Point of View of Transformation to Approach the Verification as a Whole of the Associative Law of Finite Semi-groups......Li Pingyuan [2621 1627 3220], Mathematics Teaching and Research Group (1)

Additional Discussion on the Proof of the Relation between the Fraction Method and the 0.618 Method in the Optimum Seeking Method......Quan Liwei [0356 3810 0251], Mathematics Teaching and Research Group (8)

The Effect of Cutting Conditions on the High Speed Hobbing Torque......Liang Xichang [2733 6932 2490], Chongqing University; et al. (13)

A Simple Method of Calculation for Double-circuit Transmission Lines with Mutual Inductance Coupling in Faulted Power Systems ......Mi Linshu [4717 7792 2579], Department of Electrical Engineering (17)

Solution of Load Flow Using the Metric Factor Method...... Li Wenyuan [2621 2429 3104], Department of Electrical Engineering (38)

The Parallel Substructure Method of Finite Element Analysis ......Li Runfang [2621 3387 2455], Gong Jianxia [7895 0494 7209] and Liu Chongde [0491 1504 1795], Second Department of Mechanical Engineering (50)

A Finite Element Method of Elastic Contact Problem...... Liu Chongde [0491 1504 1795], Gong Jianxia [7895 0494 7209] and Li Runfang [2621 3387 2455], all of the Second Department of Mechanical Engineering (61)

Repetition Rate Nd:YAG Laser......Yang Qimin [2799 7871 3046], Zhang Wenbi [1728 2429 4310] and Liu Xiumei [0491 4423 5019], all of the Laser Research Group (70)

Principle and Design of the Auto-detecting Machine for Ceramic Surface Defects......Zen Quankun [2582 0356 0981], Chen Yongle [7115 7167 2867], He Zhenjiang [0149 2182 3068] and Huang Renzhong [7806 0088 1813], all of the Photoelectric Precision Instruments Research Institute, Chongqing University (79)

The Method of Variation of Parameters for Nonholonomic Systems of Chetaev's Type......Liu Chengqun [0491 2052 5028], First Department of Mechanical Engineering, Chongqing University (103)

The Unity of Different Equations for Induced Normal Curvature ......Wei Yunlong [7279 0061 7127], Second Department of Mechanical Engineering, Chongqing University (115)

Respecting Objective Reality, Developing Dialectical Natural Outlook--A Discussion of Three Scientific Philosophical Problems......Ye Jun [5509 1498], Marxism-Leninism Teaching and Research Group, Chongqing University (121)

9717
CSO: 4008/443

PUBLICATIONS

TABLE OF CONTENTS OF 'CUIHUA XUEBAO,' NO 2, 1981

Dalian CUIHUA XUEBAO [JOURNAL OF CATALYSIS] in Chinese Vol 2 No 2, Jun 81 inside back cover

[Text] One-step Synthesis of 2-Ethylhexanol from Propylene by Low-pressure Carbonylation......Tain Zailong [3944 0961 7893], Wang Qi [3769 3825] and Zhang Qingzhang [1728 1987 4545], et al., all of the Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences (83)

Study on Kinetics of Addition-esterification Reaction between Carboxylic Acids and Epoxides......Liao Renan [1675 0088 1344], Xie Qinglan [6200 1987 5695], Wei Dong [7614 2639], et al., all of the Elemental Organic Chemistry Research Institute, Nankai University (92)

Disproportionation of CO on Pt/Al_2O_3 Catalyst......Xin Qin [6580 0530], Zhang Hui [1728 1979] and Xue Jun [5641 0193], et al., all of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (100)

The Acidity of Thermal Decomposition Type HZSM-5 Zeolite I. Steric Hindrance......Meng Zhongyue [1322 0022 1471] and Zhou Rixin [0719 2480 2450], both of the Department of Chemistry, Nankai University (107)

IR Studies of the Surface OH Groups and Acidity of HZSM-5 Zeolite......Guo Wengui [6753 2429 3802], Xin Qin [6580 0530] and Zhang Hui [1728 1979], et al., all of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (113)

Study of the Surface Acidity of Zeolite by Temperature Programmed Desorption (TPD) I. TPD Spectra of Pyridine Adsorbed on NaY Type Zeolites with Different Exchange Percentage of Na^+ with Ca^{2+}......Wang Gongwei [3769 0361 1983], Yin Guilin [1438 2710 2651] and Cao Ximei [2580 6932 2734], et al., all of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (121)

Study of the Surface Acidity of Zeolite by Temperature Programmed Desorption (TPD) II. TPD Spectra of n-Butylamine Adsorbed on NaY Type Zeolites with Different Exchange Percentage of Na^+ with Ca^{2+} and NH_4^+......Wang Gongwei [3769 0361 1983], Yin Guilin [1438 2710 2651] and Cao Ximei [2580 6932 2734], et al., all of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (128)

Study of the Ammonia Synthesis Catalyst A110-3......Wei Kemei [7614 0668 9485], Wang Rong [3769 2827] and Chen Zhenzhou [7115 2182 1352], et al., all of the Chemistry and Chemical Engineering Department, Fuzhou University (137)

Research Notes

Polyvinylpyrrolidone-Pd (II) Complex as Homogeneous and Heterogeneous Hydrogenation Catalysts for Alkenes......Li Yongjun [2621 3057 6511] and Jiang Yingyan [3068 5391 1750], both of the Chemistry Research Institute, Chinese Academy of Sciences (146)

Highly Active Hydrogenation Catalyst: Rh Complex of Polyvinylchloride Containing Dimethylamino Group......Chen Zonghan [7115 1350 5060] and Jiang Yingyan [3068 5391 1750], both of the Chemistry Research Institute, Chinese Academy of Sciences (149)

Synthesis of Polymeric Diphenyl(vinylbenzyl) Phosphine Supported Pd Complex and Its Catalytic Hydrogenation Activity ......Pan Caiyuan [3382 2088 0337], Feng Pinzhen [7458 0756 3791] and Liang Bingyu [2733 0393 3768], all of the Department of Modern Chemistry, Chinese University of Science and Technology (152)

Investigation of Water Photolysis with Platinized TiO_2-Tris-(2,2'-bipyridyl)-Rhodium Suspension System......Li Tongxin [2621 0681 0207], Yu Chunying [0060 2504 5391] and Tang Huanyi [3282 3562 3015], et al., all of the Dalian Institute of Chemical Physics, Chinese Academy of Sciences (156)

Aid to the Design of Catalyst with Electronic Computer...... Lin Shouru [2651 1343 1172] and Shen Jintao [3088 6930 3447], both of the Nanjing Chemical Industry Company Research Institute (159)

9717
CSO: 4008/446

TABLE OF CONTENTS OF 'HUAXUE XUEBAO,' NO 3, 1981

Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese Vol 39 No 3, Jun 81 p 192

[Text] Studies on the Voltage Delay of Cadmium-Mercuric Oxide Cells at Low Temperatures......Zhuang Jihua [5445 4949 5478], Mao Junguo [3029 0689 0948] and Zhang Huifang [4545 1920 2455], et al., all of the Department of Chemistry, Fudan University (193)

LSR Study of the Configuration of the 16α-Hydroxyl-16β-Methyl-$\Delta^{4,17(20)}$-Pregnadien-3-one--Interpretation of Pseudocontact Model for LIS......Wang Qiwen [3769 4860 2429], Chen Zhaohuan [7115 2600 3883] and Chen Yuqun [7115 3022 5028], all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (203)

Studies on the Chemical Structure of Sodium Antimony Gallate ......Ying Huiqing [2019 1979 0615], Nanjing Institute of Materia Medica (209)

A Study of the Mechanism of Knorr-Paal Condensations (I)...... Zeng Guangzhi [2582 1639 2784], Yan Jiasheng [0917 1367 泩] and Shen Dingzhang [3088 1353 3864], all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (215)

Reduction of o-Aromatic Hydroxy Carbonyl Compounds by Modified Kishner-Wolff Method......Zhong Tongsheng [0112 0681 3932] and Huang Minglong [7806 7686 7893; deceased], both of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (229)

Studies on the Active Principles of Aristolochia debilis. II. 7-Hydroxy Aristolochic Acid-A and 7-Methoxy Aristolochic Acid-A......Chen Zhongliang [7115 0112 5328], Huang Baoshan [7806 1405 1472] and Zhu Dayuan [2612 1129 0337], et al., all of the Shanghai Institute of Materia Medica, Chinese Academy of Sciences (237)

Studies on the Application of Elemento-organic Compounds of the Fifth and Sixth Groups in Organic Syntheses. VII. Proton Magnetic Resonance Spectra of Trisubstituted Cyclopropane......Shen Yanchang [3088 1693 2490], Huang Yaozeng [7806 5069 2582] and Xin Yuankang [1823 0337 1660], all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences; Xu Guangyi [1776 0342 3746], Shanghai Pharmaceuticals Industry Research Institute (243)

A New Method for the Synthesis of Bis(diethylsulfide) Decaborane......Wang Guangchang [3769 1639 2490], Lu Yixin [0712 0001 6580] and Huang Xiuyun [7806 4836 0061], et al., all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (251)

Sulfur Isotope Exchange Catalyzed by Aluminum Chloride...... Yao Jiexing [1202 0094 5281] and Yan Zhaoming [0917 0344 2494], both of Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (255)

The Alkylation of Phenolic Hydroxyl Group in Berbamine...... Chen Qinghua [7115 1987 5478], Lu Juxian [7773 5468 0103], et al., all of the Institute of Hygiene, Chinese Academy of Medical Sciences (263)

Notes

Comparison of the Solvent Extraction Properties of Di(2-ethylhexyl) Phosphate and Di(1-methylheptyl) Phosphate for Rare Earth Elements......Yang Yansheng [2799 3601 3932], Zhu Jiaqin [2612 1367 5367] and Li Yuanying [2621 3293 5391], all of the Department of Chemistry, Zhongshan University (269)

A Polarographic Study of Cadmium Nicotinate Chelates...... Shi Qinghe [2457 1987 0735], Zhang Jixian [1728 4949 0341] and Hu Huirong [5170 2837 1369], all of the Nei Monggol Medical Hospital, Hohhot (272)

Automatic Separation of Overlapping Spectral Bands with Digital Computer......Yang Xiaozhen [2799 1420 7201], Institute of Chemistry, Chinese Academy of Sciences (276)

Identification of the Structures of Corydalis F, I, J and K ......Zhu Dayuan [2612 1129 0337], Song Chunqing [1345 4783 3237] and Gao Yaoliang [7559 5069 5328], et al., all of the Shanghai Institute of Materia Medica, Chinese Academy of Sciences (280)

Primaquin as a Reagent in Inorganic Analysis. I. Detection of Cerium (IV)......Wei Fusheng [7614 1788 4141], Zhu Yurui [2612 3768 3843] and Shen Naikui [3088 0035 5525], all of the Department of Chemistry, University of Science and Technology of China, Hefei (284)

9717
CSO: 4008/456

TABLE OF CONTENTS OF 'SHUXUZ XUEBAO,' NO 4, 1981

Beijing SHUXUE XUEBAO [ACTA MATHEMATICA SINICA] in Chinese Vol 24 No 4, Jul 81 on back cover

[Text] Congruent Imbedding of a Finite Point Set in Pseudo-Euclidean Space......Zhang Jingzhong [1728 2529 0022] and Yang Lu [2799 6424], both of the University of Science and Technology of China (481)

Generalization of Hopf's Index Sum Formula......Yu Yanlin [5713 6056 2651], Mathematics Research Institute, Chinese Academy of Sciences (488)

J-Groups of Lens Spaces $L^n(4)$......Wu Zhende [0702 2182 1795], Hebei Teachers University (492)

Distribution of a Class of Remainder Times......Wu Rong [0702 2837], Nankai University (494)

A New Proof of Absence of Limit Cycles in a Quadratic System ......Chen Lansun [7115 5695 5549], Mathematics Research Institute, Chinese Academy of Sciences (504)

Construction of Normal Numbers......Zhu Yaochen [2612 1031 6591], Applied Mathematics Research Institute, Chinese Academy of Sciences (508)

The Exact Constant of Approximation for Cesàro Operators ......Sun Yongsheng [1327 3057 3932], Department of Mathematics, Beijing Teachers University (516)

An Integral Representation in the Space C^n......Chen Shujin [7115 0647 3866], Xiamen University (538)

Recurrent Motion and Trajectory Stability......Huang Wenzao [7806 2429 3501], Beijing University (545)

Finite Invariant Measures and One-dimensional Diffusion Processes......Gong Guanglu [7895 0342 7627], Department of Mathematics, Beijing University (551)

Automorphism of $SL_2(K)$ over a Class of Skew Fields...... Ren Hongshuo [0117 1347 4311], Mathematics Research Institute, Chinese Academy of Sciences (566)

The Lower Estimation of Linear Forms of a Class of G-Functions ......Xu Guangshan [1776 1639 0810], Mathematics Research Institute, Chinese Academy of Sciences (578)

Some Types of Non-symmetric Homogeneous Domains......Zhong Jiaqing [6945 1367 1987], Mathematics Research Institute, Chinese Academy of Sciences; Yin Weiping [3009 1983 5493], University of Science and Technology of China (587)

Extended Spaces of Non-symmetric Classical Domains...... Zhong Jiaqing [6945 1367 1987], Mathematics Research Institute, Chinese Academy of Sciences; Yin Weiping [3009 1983 5493], University of Science and Technology of China (614)

9717
CSO: 4008/444

PUBLICATIONS

TABLE OF CONTENTS OF 'GAONENG WULI YU HE WULI,' NO 4, 1981

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 5 No 4, Jul 81 inside back cover

[Text] Relativistic Equal-time Equation (I)......Ruan Tunan [7086 0956 0589], University of Science and Technology of China; Zhu Xiquan [2612 3356 3123], He Zuoxiu [0149 4373 1652] and Qing Chengrui [1987 2110 3843], all of the Institute of Theoretical Physics, Chinese Academy of Sciences; Zhao Weiqin [6392 4850 0530], Institute of High Energy Physics, Chinese Academy of Sciences (404)

Straton Masses and Cabibbo Angles......Xu Dezhi [1776 1795 0037], Institute of High Energy Physics, Chinese Academy of Sciences (411)

The Process $e^+ + e^- \to \pi + q + \bar{q}$ in Quantum Chromodynamics...... Huang Chaoshang [7806 2600 0794] and Dai Yuanben [2071 0337 2609], both of the Institute of Theoretical Physics, Chinese Academy of Sciences (416)

Glue Bag Model and Mass Spectra of Hadrons......Yin Pengcheng [3009 7720 4453], Zhou Gusheng [0719 6253 5116] and Wang Jiazhu [3769 1367 3796], all of Fudan University; Wang Zi [3769 3320], University of Science and Technology of China (428)

Bose Condensation of SU(2) Higgs Fields and the Electron Mass in Weinberg-Salam Model......Ni Guangjiong [0242 0342 3518], Su Rukeng [5685 3067 6972] and Chen Suqing [7115 5685 0615], all of Fudan University (440)

The "Unitary Energy Band" Structure in the Baryon-Antibaryon System......Wang Weiwei [3769 3452 3452], Institute of Theoretical Physics, Chinese Academy of Sciences; Zhang Yushun [1728 4416 7311] and Li Yangguo [2621 2254 0948], both of the Institute of High Energy Physics, Chinese Academy of Sciences; Chen Xiaotian [7115 2556 1131] and Ruan Tunan [7086 0956 0589], both of the University of Science and Technology of China (450)

On the Analysis of Segmented Ring of Permanent Magnet Multipole Fields......Liu Maosan [0491 5399 0005], Chen Renhuai [7115 0088 2037], Wu Wentai [0702 2429 3141] and Li Shuzhen [2621 3219 3791], all of the Institute of High Energy Physics, Chinese Academy of Sciences (457)

J Particle-Nucleus Scattering......Zhang Yushun [1728 4416 7311], Liu Xianhui [0491 2009 6540] and Li Yangguo [2621 2254 0948], all of the Institute of High Energy Physics, Chinese Academy of Sciences; He Zuoxiu [0149 4373 1652], Institute of Theoretical Physics, Chinese Academy of Sciences (464)

Scattering Amplitude with Large Momentum Transfer Calculated from the Bakamjian-Thomas Equation and the Repulsive Core of Nuclear Force......Pan Qizhi [3382 4874 2535], Zhao Weiqin [6392 4850 0530] and Bao Chengguang [7637 6134 0342], all of the Institute of High Energy Physics, Chinese Academy of Sciences; Wang Weiwei [3769 3452 3452], Institute of Theoretical Physics, Chinese Academy of Sciences (471)

The Vertical Intensity of the Antiproton at the Atmospheric Depth $x = 700$ g/cm^2......Qin Keyu [6009 0344 1342], Institute of High Energy Physics, Chinese Academy of Sciences (476)

Propagation of Cosmic Ray Electrons in the Galaxy...... Zhang Heqi [1728 0735 4388], Purple Mountain Observatory, Chinese Academy of Sciences (483)

High Energy Primary Electron Spectrum and Diffusion X-ray Source......Xu Chunxian [1776 2504 1288], Institute of High Energy Physics, Chinese Academy of Sciences; Zhang Heqi [1728 0735 4388], Purple Mountain Observatory, Chinese Academy of Sciences (488)

The Momentum Distribution of the Nuclear Cluster for ^{6,7}Li Nuclei......Han Wenshu [7281 2429 6615], Lu Zhaoqi [4151 0340 0796], Zhuang Fei [5445 2431] and Zheng Yuming [6774 3768 2494], all of the Institute of Atomic Energy, Chinese Academy of Sciences (492)

Two-Nucleon Transfer Reactions on Deformed Nuclei...... Wu Chongshi [0702 1504 6107] and Zeng Jinyan [2582 6210 6056], both of Beijing University (502)

The Generator Coordinate Method for the Coupling between the Pairing and Surface Vibrations......Fu Deji [0265 1795 1015] and Xia Keding [1115 0344 1353], both of the Institute of Nuclei, Chinese Academy of Sciences, Shanghai (507)

Research Notes

Analyzing the Property Superband by Using 2Δ......Gao Yuanyi [7559 0337 5030], Institute of Modern Physics, Chinese Academy of Sciences (512)

$i(\omega)$ and Effective Rotation-alignment Angular Momentum J...... Gu Jinnan [7357 6855 0589], Institute of Modern Physics, Chinese Academy of Sciences (517)

A Complementary Analysis of the Experimental Data for Reaction $^{12}C + {}^{209}Bi$ at the Incident Energies Slightly Above the Coulomb Barrier......Xu Shuwei [1776 2885 1218], Institute of Modern Physics, Chinese Academy of Sciences (520)

9717
CSO: 4008/458

PUBLICATIONS

TABLE OF CONTENTS OF 'SHUIWEN DIZHIGONGCHENG DIZHI,' NO 4, 1981

Beijing SHUIWEN DIZHIGONGCHENG DIZHI [HYDROGEOLOGY AND ENGINEERING GEOLOGY] in Chinese No 4, 1981 preceding p 1

[Text] Contents (Partial)

Reciprocal Transformation of Ground Water and River Water and Rational Utilization of Water Resources in the Gansu Corridor ......Fan Xipeng [5400 6932 2590], Gansu Geology Bureau Research Institute (1)

Some Views on Development and Utilization of Water Resources in the Huang-Huai-Hai Plain......Xu Zhirong [6079 1807 2837], Hydrology and Geology Team No 17, Henan Geological Bureau (6)

Rational Development and Scientific Management of Groundwater Resources in the Region of Beijing......Yang Yutong [2799 3022 2717], Beijing Hydrogeology and Engineering Geology Brigade (8)

Quality Regime of Confined Ground Water under the Effects of Exploitation and Recharge......Sun Cuiyu [1327 5050 3768], Jia Xiu [6328 3811] and Yuan Zhaodun [5913 0340 4163], all of the Shanghai Geology Office (11)

Preliminary Analysis of the Reasons for Exhaustion of Jinsi Spring......Wang Xiujin [3769 4423 6651], Tang Bangyi [3282 1620 5030] and Zhou Zhongxiao [0719 1813 1321], all of the First Hydrology and Geology Brigade, Shanxi Bureau of Geology (17)

The Neotectonic Fissure Water......Xiao Nansen [5135 2809 2773], Nanjing University (22)

Research on Enrichment Low of Ground Water in Red Formation ......Lu Jinkai [4151 6855 0418], Hydrogeology and Engineering Geology Bureau, Ministry of Geology (26)

Water-stored Structure and Water-abundance of Red Formation in Northern Sichuan Province......Chen Xichang [7115 0823 2490], PLA Unit 00931 (29)

Preliminary Discussion of Fissure Water in Weathered Zone of Red Formation in the Sichuan Basin......Zhou Xulun [0719 4872 4858], Sichuan Hydrogeology and Engineering Geology Brigade (33)

Water-bearing Characteristics of Red Formation in Jiangxi Province......Gao Zhongtan [7559 1813 1098], Hydrogeology Brigade, Jiangxi Geological Bureau (36)

On Bad Water Quality Frequently Occurring in Red Formation ......Liu Guangyao [0491 0342 1031], Survey Science and Technology Research Institute, Bureau of Metallurgy (37)

The Effects of Acidic and Basic Media on Engineering Geological Properties of Sticky Soil......Huang Shiming [7806 0013 6900], Design Academy, Ministry of Textile Industry (41)

The Change of Loess Moisture Content and Forecasting Evaluation of Foundation......Guan Wenzhang [7070 2429 4545], Xi'an Survey Company, Ministry of Metallurgy (46)

Collapse of Tunnel in Granite by Great Water Flow......Ma Deqin [7456 1795 0530], Second Geological Survey Team, Chengdu Survey and Design Academy, Ministry of Electric Power Industry (49)

A Method of Simplified Solution for Thickness of Soil Compression Zone in Foundation......Guo Huasheng [6753 5478 4141], Xiamen Design Academy (50)

Preliminary Application of Simplified Numerical Coding in Hydrogeological Visible Interpretation of Satellite Photographs......Li Jinghao [2621 2529 6275] and Li Baolin [2621 1405 2651], both of the Hydrogeology and Engineering Geology Technology and Methodology Research Team, Ministry of Geology (52)

A Course of Lectures on Moisture Migration in Aeration Zone (IV)......Zhang Weizhen [1728 5588 2830] and Zhang Yufang [1728 3842 5364] ((55)

9717
CSO: 4008/461

PUBLICATIONS

TABLE OF CONTENTS OF 'QICHE JISHU,' NO 6, 1981

Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 6, 1981 p 1

[Text] Design and Research

Full Working Condition Simulation of Steady-state Turning Behavior (Part 2)......Guo Konghui [6753 1313 6540], Changchun Automotive Research Institute (2)

The Presetting of a Solid Round Torsion Bar......Lu Rongchu [4151 2837 0443], Fuzhou Automobile Plant (12)

The Modification of the Jiefeng Truck Engine (Part 1)--Summarization......Kang Guodong [0073 0948 2767], Changchun Automotive Research Institute (16)

Measurement and Study of Temperature of the Cylinder-head of Diesel Engines......Luo Xinmin [5012 2450 3046] and Qiao Huiying [0829 1920 5391], both of the Chongqing Heavy Vehicle Research Institute (23)

Technology, Equipment and Materials

Gas Tuffride Testing......Wang Jiaren [3769 1367 0088], Nanjing Automobile Plant (27)

Discussion on the Deformation of the Driven Gear of the Jiefeng Truck (Model CA 10B) Final Drive after Heat Treatment ......Zhou Guoxin [0719 0948 2450], Linyi Automobile Transportation Company, Shandong (33)

Study and Application of Vermicular Graphite Iron Treated by Rare Earth Magnesium and Titanium (Part 1)......Chen Xiudi [7115 4423 1229], et al. (36)

Maintenance and Service

Causes and Remedies of Truck Frame Rupture......Song Jingying [1345 6975 3467], Qinghua University (42)

Discussion of the Formulas for Calculating the Front Wheel Alignment Measurements......Lu Gang [4151 0474], Chongqing Branch, Scientific Research Institute, Ministry of Transportation and Communications (44)

An Analysis of Cylinder Scuffing of Skoda TMS 24 Dumper......Pan Zhiqiang [3382 1807 1730], Fuzhou Import-Export Product Inspection Bureau (50)

Environmental Protection

Study on Platinum (Pt) Catalyst and Its Reactor Used on the "Hongqi" Sedan......Yin Dekui [1438 1795 7608], Changchun Automotive Research Institute (53)

Design Series

Selection of the Type and Design of an Automobile Trailer (Part 6)......Chen Chuanxin [7115 0278 0207] and Zhang Xiuzhi [1728 4423 5347], Hanyang Automobile Manufacture and Parts Plant (62)

9717
CSO: 4008/438

TABLE OF CONTENTS OF 'HUAXUE TONGBAO,' NO 7, 1981

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 7, Jul 81 on back cover

[Text] Chemistry Can Do a Lot--An Interview with Professor Lu Jiaxi, the New President of the Chinese Academy of Sciences ......Wang Zhihao [3769 3112 3165] (1)

Structure of Cluster Compound......Liu Juzheng [0491 5282 2973], Theoretical Chemistry Research Institute, Jilin University (3)

Thermal Neutron Inelastic Scattering Spectra of Hydrous Titanium Oxide......Chen Guiying [7115 2710 5391], Cheng Zhixu [2052 0037 4872] and Ruan Jinghui [7086 2529 6540], all of the Atomic Energy Research Institute, Chinese Academy of Sciences; Deng Hualong [6772 5478 7893], Qiao Meifang [0829 5019 5364] and Tang Guoliang [0781 0948 5328], all of the Shanghai Environmental Chemistry Research Institute (13)

Theoretical Study of Normal and Isomeric Product Distribution in the Hydroformylation of Olefine......Li Dagang [2621 6671 0474] and Zhao Xiuru [6392 4423 5423], both of the Lanzhou Chemistry and Physics Research Institute, Chinese Academy of Sciences (14)

A Multinuclear Approach to the Stereochemistry of Double Bonds......G.J. Martin (18)

Use of Double Resonance Techniques in Dynamic NMR--The Problem of the Determination of Activation Parameters......M.L. Martin (19)

A Method of Purification of Nitrogen Gas--The Preparation and Application of Activated Copper......Zhang Manzheng [1728 2581 1767], Duan Changsheng [3008 7022 3932] and Chen Jilan [7115 4949 5695], all of the Hubei Chemistry Research Institute (21)

Plasma Polymerization of Ethylene in N_2 Gas......Chen Jie [7115 2212], Liu Xueshu [0491 1331 1859], Ye Mu [5509 3668] and Wang Shicai [3769 0013 2088], all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (22)

HSIEC Separation of Alkaline-earth Metals and Rapid Determination of Ca, Zn, Ba in Oil Additives......Fan Biwei [5400 1801 1218], Liu Mancang [0491 3341 0221] and Hu Zhide [5170 0037 1795], all of the Department of Chemistry, Lanzhou University (25)

Ultraviolet Photoelectron Spectroscopy and Molecular Orbital Theory......Wang Dianxun [3769 3013 0534], Chemistry Research Institute, Chinese Academy of Sciences (29)

Examples of the Application of Programmable Calculations to Experiments in Physical Chemistry......Cai Shengmin [5591 3932 3046] and Liu Wanqi [0491 8001 4388], both of the Department of Chemistry, Beijing University (35)

The Bases of Judging Aromaticity......Jiang Xianming [5592 0341 2494], Department of Chemistry, Guangxi Teachers College (40)

Cross Sectional Areas of Molecules Adsorbed on Solid Surfaces ......Dai Minguang [2071 7044 0342], Department of Chemistry, Fuzhou University (46)

The Definition and Relationships of Different Kinds of Bond Energies......Liao Daizheng [1675 0108 2973] and Zhu Zhiang [2612 1807 2491], both of the Department of Chemistry, Nankai University (51)

Linus Pauling: An Interview...... (55)

9717
CSO: 4008/457

TABLE OF CONTENTS OF 'HUAXUE TONGBAO,' NO 8, 1981

Beijing HUAXUE TONGBAO [CHEMISTRY] in Chinese No 8, 18 Aug 81 on back cover

[Text] Advances in the Chemistry of Marine Natural Products ......Zheng Shuzhen [6774 3219 6297], Guangzhou Chemistry Research Institute, Chinese Academy of Sciences (1)

Determination of Sodium Content in Sodium Antimony Gallate (Sb-273) by Ion Exchange Technique......Ying Huiqing [2019 1979 0615] and Pan Xiuhua [3382 4423 5478], both of the Nanjing Pharmaceuticals Research Institute (9)

Preparation of 4-Chloro-3-Methoxy-5-Nitrobenzonitrile from Vanillin......Zhou Qiting [0719 0796 7200] and Xu Yibao [1776 0308 1405], both of the Shanghai Pharmaceuticals Research Institute, Chinese Academy of Sciences (9)

Crystal Growth and Spectrum of Terbium Pentaphosphate...... Hong Guangyan [3163 1639 6056], Yue Shuying [6390 3219 5391], Wang Qingyuan [3769 1987 0337] and Cheng Guangjin [4453 1639 6855], all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (10)

Semi-empirical Calculation of ^{13}C and ^{15}N Chemical Shifts ......G.J. Martin (12)

Relaxation Phenomena and Experimental Techniques in ^{15}N Spectroscopy......M.L. Martin (13)

Analysis of Steroids by NMR......Yi Danian [2496 1129 1628] and Xu Guangyi [1776 0342 3746], both of the Shanghai Pharmaceutical Industry Research Institute (14)

Separation of 16 Rare Earth Elements by High Performance Liquid Chromatography......Zhao Guiwen [6392 6311 2429] and Luo Siquan [5012 1835 3123], both of the Department of Chemistry, University of Science and Technology of China; Yao Shouren [1202 1343 0088] and Yu Shukun [2456 3219 0981],

both of the Anhui Environmental Protection Research Institute (17)

Phase Sensitive Alternating Current Polarograph......Deng Jiaqi [6772 1367 4388], He Peixin [0149 0160 9515] and Chen Xiaoming [7115 2556 2494], all of the Department of Chemistry, Fudan University (20)

Study of Surface Adsorption by Two Desorption Methods Effect ......Guo Yuanheng [6753 0337 1854], Department of Physics, Beijing University (24)

Computer Representation of Chemical Structures......Guo Chuanjie [6753 0278 2638], Chemistry Research Institute, Chinese Academy of Sciences (32)

Enzyme and Catalysis......Wu Yue [0702 6390], Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (38)

The Present Condition of Radiation Chemistry......Liu Yuming [0491 6877 6900], Shanghai Chemical Engineering Research Institute; Ma Ruide [7456 3843 1795], Shanghai University of Science and Technology (46)

Further Discussion on Oxidation-reduction Property of Inorganic Oxo-acids......Liu Shuxiang [0491 2885 4382], Qufu Teachers College (52)

Synthesis of Element 107......Zhang Qinglian [1728 7230 5571], Department of Chemistry, Beijing University (56)

In Memory of the Famous Organometallic Chemist, Professor Minoru Tsutsui.....Huang Yaozeng [7806 5069 2582] and Qian Changtao [6929 7022 3447], both of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences; Jiang Yingyan [3068 5391 1750], Institute of Chemistry, Chinese Academy of Sciences (58)

Poem in Memory of the Late Professor Minoru Tsutsui...... Huang Yaozeng [7806 5069 2582], Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (57)

9717
CSO: 4008/465

AUTHOR: Bai Kunpu

ORG: None

TITLE: "The Imaging Properties of Visual Telescopic System"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Aug 81 pp 11-18

TEXT OF ENGLISH ABSTRACT: This paper presents the imaging property representation of monochromatic light and polychromatic light of the visual telescopic system based on the general equation of polychromatic OTF, taking the product of D_{65} light source distribution and standard relative visibility factor as a weighted function. By correcting the spectra of equipment (light source and receptor) of the MTF measurement, we have directly measured the polychromatic MTF of axial image point. In addition, referring to a variety of the proximate equations, this paper proposes that the polychromatic MTF can also be reduced to the calculating equation $1/3(T_{500.0} + 2T_{589.3})$, where $T_{500.0}$ and $T_{589.3}$ represent the MTF of wave lengths of 500.0 mμ and 589.3 mμ respectively. After having compared the results of both methods mentioned above with the exact calculated results, we conclude that both methods are reliable and convenient. As for off-axial image point, the measurement of the lateral chromatic aberration of half visual field is commended. Measuring method, parameter processing and some examples are briefly presented in this paper.

AUTHOR: WAN Yaoqing

ORG: None

TITLE: "The Development and Application of the Mechanical Optimal Design"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Aug 81 pp 52-59

TEXT OF ENGLISH ABSTRACT: The further research of the optimal calculating methods and wide application of the electronic computer provide the engineering designs with effective strong mathematical and computation instruments, which bring about a great change in the product design method. Mechanical products with optimal design have been increasing day by day for more than 20 years, especially in the 1970's. The development of the engineering design method, the reason for the optimal design development and the application of the optimal computation method in the mechanical industry are summarized in this paper, and the urgent assignment to engineering designers is also put forward.

AUTHOR: LI Xuetong

ORG: None

TITLE: "The Relationship between Ballistic Behavior and Structural Microdefects of T Propellant--An Application of SEM in the Study of Doublebase Propellant"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Aug 81 pp 60-67

TEXT OF ENGLISH ABSTRACT: The microstructure of a sampling propellant at different ballistic behaviors and under different manufacturing conditions is analyzed with a scanning electron microscope. The samples are taken from a homogeneous T propellant gelatinized by repellent solvent and shaped by thrusting. It is found that in the powder grain a lot of microdefects are unevenly but regularly distributed; the defects on the samples of normal and abnormal ballistic behavior are clearly different; the grains with good structure made under specific manufacturing conditions show normal ballistic behavior and structural changes caused by low temperature are observed. On the basis of analysis of the micropictures, the mechanism of inherent structural defects of abnormal ballistic behavior for T propellant is presented and critical technology which makes the ballistic behavior normal is analyzed.

9717
CSO: 4009/484

AUTHOR: None

ORG: Combustion and Heat Transfer Engineering Teaching and Research Faculty

TITLE: "Experimental Investigation of Preparation and Handling of COM in Zhejiang University"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 2, 25 Jun 81 pp 1-14

TEXT OF ENGLISH ABSTRACT: The experimental facilities of preparation, storage, handling and combustion system of COM in Zhejiang University are briefly introduced. Various properties of COM, with 10-69 percent coal powder concentration by weight, such as rheological and vaporization properties, isothermoflow and nonisothermoflow, field of temperature and velocity distribution in heating tube, sedimentation of coal particles, power consumption of propeller type mixer, homogeneity of COM preparation, heat exchange of COM with coil heater, under temperature variation ranging from 40 to 120°C, etc., were experimentally determined. The relationship of the apparent viscosity μ_p, or the homogeneity factor k and the coefficient of rheological property n as a function of C_W and T may be written in the form of an exponential function. It has been found that COM is a kind of pseudoplastic fluid, its flow properties in most pipes consist of laminar flow and its pressure drop may be calculated by the laminar flow formula of pseudoplastic fluid with 7.85 percent standard error.

AUTHOR: None

ORG: Combustion and Heat Transfer Engineering Teaching and Research Faculty

TITLE: "Experimental Study of COM Combustion Process in the Tunnel Furnace"

SOURCE: Hangzhou ZHEJIANG DAXUE XUEBAO [JOURNAL OF ZHEJIANG UNIVERSITY] in Chinese No 2, 25 Jun 81 pp 15-33

TEXT OF ENGLISH ABSTRACT: In this paper, a description is given of the experimental tunnel furnace, equipped with the specially designed atomizing nozzle, which can run with good stability for a long time when burning COM with coal concentration as high as 40~50 percent. The combustion efficiency approached that of the furnace when burning heavy oil.

The dynamic properties of the combustion process, the rate of mass flow, the characteristics of its components, the heat flux and the emissivity of the COM flame along the axis of the tunnel furnace have been experimentally studied.

According to microscopic examination of the samples, it is found that the combustion of COM in the furnace has been carried out in the form of cenospheres with exit openings of different sizes. It is of no doubt that the combustion property of COM in the furnace is quite different from that of heavy oil droplets or that of coal particles.

9717
CSO: 4009/483

AUTHOR: ZHENG Zhaochang [6774 4453 2490]
WU Jianji [0702 1696 1015]

ORG: Both of the Department of Engineering Mechanics

TITLE: "Dynamic Analysis of Vehicle Structures by Modal Synthesis Techniques"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 1-11

TEXT OF ENGLISH ABSTRACT: In this paper, the modal synthesis techniques are adopted for the vibration analysis of the whole vehicle structural system. The analysis procedure begins by subdividing the whole vehicle structural system into some component parts, substructures, such as body, chassis frame, wheels and axes, engine and attachment elements, such as body mounts, engine mounts and tires. For the elastic components, such as the chassis frame, the free-free natural frequencies and mode shapes can either be calculated by the finite element method or provided from experimental tests. The engine, wheels and axes may be taken as rigid bodies. These substructures are connected by attachment elements. All types of attachment elements are represented by linear elastic springs in the analysis. With the modal coordinates, after writing out the expression for the kinetic and potential energies of free-free substructures and springs, motion equations of the whole system can be obtained by Lagrange's equations. Only the spring forces are coupling terms of motion equations. All information of dynamic characteristics

[Continuation of QINGHUA DAXUE XUEBAO Vol 21 No 3, 1981 pp 1-11]

comes from separate analysis for each of the substructures. An approach emphasizing the clearness of physical concepts, mathematical simplicity, accuracy of results and for smaller computer capacity is thus presented. According to the final computer program, an example is given which shows advantages of the method.

AUTHOR: None

ORG: None

TITLE: "Success in Investigation of Hollow Cathode Discharge Ion-plating"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 p 12

ABSTRACT: The Nuclear Technology Research Institute of Qinghua University has successfully developed a HCD ion-plating apparatus. This technology has a wide application on measuring instruments, cutting tools, dies, etc., to increase surface resistance to corrosion and abrasion and extend working life. It has also proved valuable in the light industrial sector in plating wristwatch cases and bands, etc. A primary feature of this technology is that the metal thus plated is highly ionized.

AUTHOR: None

ORG: Scientific Research Group of Speech Recognition, Department of Computer Engineering and Science

TITLE: "The Application of a Microcomputer System for Speech Recognition"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 13-24

TEXT OF ENGLISH ABSTRACT: In this paper, the application of a microcomputer system for speech recognition is described. Original information is obtained from a digital dynamic spectral analyzer which gives the speech spectral data. The information is compressed either by a method called "blocking quartering" or by a two-dimensional Walsh transformation. Then the main information representing the features of the speech is extracted. This system must be trained at first to recognize the appointed words. An example of speech recognition by these two different methods is given as follows: (1) recognition of the names of 128 railway stations, including 78 stations on the Beijing-Guangzhou line and 50 stations on the Beijing-Mudanjiang line, by "blocking quartering;" (2) recognition of the names of 78 railway stations on the Beijing-Guangzhou line by two-dimensional Walsh transformation. The resulting identification accuracy of both methods reached approximately 97 percent.

AUTHOR: GUO Yili [6753 1150 3810]
YAO Minyan [1203 2404 6056]
ZHONG Lichen [6945 4539 2525]
et al.

ORG: All of the Department of Radio and Electronics

TITLE: "A Study on Stimulated Raman Scattering in Doped Optical Fibers"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 25-33

TEXT OF ENGLISH ABSTRACT: This report is one of experimental investigations on multidegree stimulated Raman scattering spectrum in ordinary GeO_2 fibers for optical communication. The comparison of the characteristics between the SRS spectra of GeO_2 fiber and P_2O_5 fiber has been demonstrated. The frequency shifts and relative intensity configuration of multidegree Stokes spectrum were measured and a simple analysis of spectrum characteristics using the concepts of effective scattering cross section and differences of vibrational energy levels was given. The purpose is to search for the possibility of a SRS fiber laser device with these two kinds of ordinary fibers.

AUTHOR: None

ORG: None

TITLE: "High Resolving Power Strippable Film Transfer Grids Type FG Win National Invention Prize"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 p 34

ABSTRACT: The dense grid moire method developed has wide applications in the determination of the strength and rigidity of engineering structures and machine components. It is also useful in the study of plastic deformation technology, material fracturing, etc. The FG grid has a resolution which equals or exceeds that of similar foreign products, giving clear borders and sharp black/white discrimination even at 500 lines/mm. It has been termed "outstanding" by American, West German and Japanese professionals.

AUTHOR: LUO Zhichang [5012 1807 2490]
TIAN Yan [6944 3601]
LI Naixuan [2621 0035 6693]
et al.

ORG: All of the Department of Mechanical Engineering

TITLE: "An Investigation of Formation and Propagation of Hydrogen Induced Cracks in High Strength Steel Testing Implant Using Acoustic Emission and Fractography"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 35-46

TEXT OF ENGLISH ABSTRACT: The initiation, propagation and rupture process of hydrogen induced cracks in high strength steel testing implant were studied by using acoustic emission. It was found that the initial position of delayed cracking in testing implant with circulat notch is regular. According to the wave form of acoustic emission, the process is divided into four stages: initiation, delayed crack propagation, rapid propagation and instantaneous rupture. The corresponding areas of these stages can be recognized on the fracture. The corresponding relationships between the stages and areas depend on stress, hydrogen and metallographic structure.

In addition, the effects of hydrogen content, structure and properties of HAZ on the microappearance of fracture have also been studied.

AUTHOR: HAN Liying [7281 7787 3841]
WANG Jinyu [3769 3866 3768]

ORG: Both of the Department of Fundamental Courses

TITLE: "Broad-band Multilayer Film with High Reflectance"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 47-58

TEXT OF ENGLISH ABSTRACT: This paper begins with the characteristic matrix of multilayer film of non-absorbing dielectric materials and the calculations of reflectance and transmittance of light for multilayer film is given. The band width of high reflectance of $\lambda/4$ multilayer film is discussed. The method and technology of vacuum dissipation of broad-band multilayer mirror with high reflectance over an extended spectral region are described. The mirror is applied to the hollow cathode discharge He-Cd laser with multi-spectral line power output above 50 mw.

AUTHOR: JIN Zhiyuan [6855 0037 0997]
HUANG Xueping [7806 1331 1627]
PENG Shurong [1756 6615 2837]

ORG: JIN and HUANG both of the Department of Precision Instruments; PENG of the Tangshan Gear Plant

TITLE: "An Investigation of the Conventional HSS Cutting Performance by SOCNB Complex Permeation Treatment Method"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 59-70

TEXT OF ENGLISH ABSTRACT: The good cutting performance of the conventional HSS ($W_{18}Cr_4V$) cutting tool subjected to a new surface chemical heat treatment technique has been studied in this paper. The characteristic of this new technique is that through the process of complex permeation treatment many chemical elements, such as carbon, nitrogen, sulfur and oxygen, can be permeated into the surface layer of the cutting tool.

The results of this research show that the antifriction capability, wear and heat resistance of the layer of the treated cutting tool have been improved and, in general, the tool life can be stably increased by 100 to 200 percent.

AUTHOR: SHEN Tianyao [3088 1131 5069]

ORG: Department of Engineering Mechanics

TITLE: "Solution of the Problem of the Laminar Boundary Layer with Pressure Gradient in a Rotating System and Its Application in Impeller Design"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 71-91

TEXT OF ENGLISH ABSTRACT: The first part of this paper deals with the application of Karman and Pohlhausen's method to the general problem of a two-dimensional laminar boundary layer with pressure gradient in a rotating system. It is a generalization of the approximate integration method for solving the problem of a two-dimensional laminar boundary layer with pressure gradient in a stationary system. But the generalized method could be applied to a rotating system. When the rotating speed is equal to 0, the results could be transformed to the original form given by H. Holstein and T. Bohlen.

In the second part of this paper, the boundary layer growth for three types of velocity distribution at the trailing side which are typical for centrifugal impeller blades is calculated, and the optimum velocity distribution is also discussed. The conclusion essentially agrees with the results given in a previous paper. The position of separation at the trailing side was calculated for blades of two

[Continuation of QINGHUA DAXUE XUEBAO Vol 21 No 3, 1981 pp 71-91]

different impellers and the results were compared with the measured values. The two experimental impellers were designed to satisfy the reverse transition criterion. The results of our method have been compared with the exact solutions of the laminar boundary layer problem on a rotating circular arc blade given by R.M. Halleen, J.P. Johnston and W.C. Reynolds. Our results are also compared with those given by G. Jungclaus concerning the solution of the boundary layer problem on a rotating flat-plate blade by using the Karman-Pohlhausen method.

AUTHOR: None

ORG: None

TITLE: "New Achievements in Development of the Key Task of Bucket Tooth Life on Bucket Wheel Excavator and DM-1 Dynamic Load Abrasive Wear Tester"

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 p 92

ABSTRACT: (a) Qinghua University, in concert with the Hangzhou Heavy Machine Works, has developed a "durable cast steel alloy insert" which increases the tooth life of a bucket wheel excavator from 60 to more than 180 hours. Because the technology involved is simple, low-cost and long-lasting, it is estimated that its application nationwide could save tens of millions of yuan.

(b) The DM-1 Dynamic Load Abrasive Wear Tester was designed and developed by the Metals Teaching and Research Group, Qinghua University. The instrument utilizes a combination of mechanical and electrical testing; it can operate under varying loads, with different abrasives, at varying friction speeds; and its primary technical parameters have a relative error of <6 percent in one or multiple tests.

AUTHOR: SHEN Zhupei [3088 4371 1014]
WU Zhenhui [0702 2182 6540]
ZHAO Hongbin [6392 7703 6333]

ORG: All of the Department of Physics Engineering

TITLE: "Stresses and Displacements in Rotating Toroidal Shells"*

SOURCE: Beijing QINGHUA DAXUE XUEBAO [JOURNAL OF QINGHUA UNIVERSITY] in Chinese Vol 21 No 3, 1981 pp 93-110

TEXT OF ENGLISH ABSTRACT: In this paper, Zhang Wei's asymptotic solution for Tölke's equation of axial symmetric toroidal shell in complex variable is extended to the second order solution, both for centrifugal and axial loads. A power series solution is also obtained. Both solutions are used in the calculation of C-type bellows. A comparison of calculated results shows close coincidence with each other for the whole range of φ except at the vicinity of φ = 0, while for small φ there exists a small difference between them.

* This work has been carried out under the direction of Professor ZHANG Wei [1728 4850].

9717
CSO: 4009/1

Geology

AUTHOR: WANG Daojing [3769 6670 4842]

ORG: Institute of Geology, Anhui Metallurgic and Geological Exploration Corporation

TITLE: "Some Relationships between the Geological Structures and the Skarn-type Copper Deposits in the Tongling Area"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 4, 1981 pp 301-306

TEXT OF ENGLISH ABSTRACT: The Tongling area is a geodome in the diwa (geodepression) region in central China. The contact between the Mesozoic intermediate-acid intrusive magmatic rocks and the carbonate rocks in the proper tectonic layer of the platform resulted in abundant skarn-type copper ores. The mineralized horizons and the metallic mineralization types of the copper deposits appear to be controlled by the geological structures. The main manifestations are as follows:

1. The mineralized horizon of the deposits in the anticlines is lower than that in the syncline. The higher the anticline is uplifted, the lower the mineralized horizon will be; whereas the lower the syncline is depressed, the higher the mineralized horizon will be. In the same fold, the mineralized horizon is elevated with the plunging of the hinge. This reflects the connection between the mineralization depth and the paleostructure--erosion surface (during the mineralization) for this type of deposit.
2. The geological structures seem to control the zoning of the endogenic metallic

[Continuation of DIZHI LUNPING Vol 27 No 4, 1981 pp 301-306]

mineralization and the distribution of the mineralizing types. In the same ore field, the surface mineralization zoning is controlled by the plunging of the hinge of the fold. At places where the hinge of the fold is uplifted, the deep-level mineralization zone may be exposed due to more denudation, while at places where there has been little denudation along the plunging hinge only shallow-level mineralization zone is exposed. On a regional scale, the plunging end of an anticline controls the high-sulfur mineralization, which gradually grades to the high-oxygen type with the elevation of the hinge of the anticline. The compressive fault created a closed reducing environment, controlling the high-sulfur mineralization, whereas the tensional fault brought about an open oxidizing environment, controlling the high-oxygen mineralization. The mineral assemblages of various orebodies in the same ore deposit may also vary because of different mechanical properties of the ore-bearing structures. The ore mineral in the orebodies controlled by the compressor-shear fault is chalcopyrite, while those in the orebodies controlled by a tenso-shear fault are pyrite and bornite. The mineral assemblages in different sections of the same orebody may also differ because of different states of stresses.

AUTHOR: QIU Shiqiang [6726 0013 1730]

ORG: Geological Division, Dabaoshan Mine

TITLE: "A Preliminary Study of the Genesis of the Dabaoshan Stratiform Polymetallic Deposit"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 4, 1981 pp 333-340

TEXT OF ENGLISH ABSTRACT: This paper consists of three parts. Part 1 briefly describes the general geology of the mining area, the geological conditions for ore deposition (including ore-bearing strata, structure and magmatic activity) and basic characteristics of the deposit, and discusses the relationship between the geological conditions and the deposit. Part 2 is dedicated to the analysis of the sources of the ore-forming substances. The various geological grounds for the source of ore-forming substances of the deposit are discussed in five aspects (the tectonic cycle, the abundance of metallic elements in ore-bearing strata, the characteristics of sulfur isotopes and the intrusion of intermediate-acid rocks during the Yanshanian movement), which lead to the conclusion that there are multiple sources of ore-forming substance. The ore-forming substances were mainly derived from oldland (crust source) and submarine eruption (mantle source). Part 3 is a discussion of the metallogenic stages and the genesis of the deposit. In this paper the ore deposit-forming process is divided into four stages: sedimentation--

[Continuation of DIZHI LUNPING Vol 27 No 4, 1981 pp 333-340]

diagenesis--hydrothermal reformation--oxidation, and the following idea of the process is proposed: first the Devonian sedimentation resulted in the source bed, which was subsequently superimposed and reformed by hydrothermal solutions (enriched in W, Bi, Mo, Nb-Ta, Re, Cd, Ga, In, Se, Te and Tl) related to the Yanshanian intermediate-acid magmatic rocks, giving rise to the ore-forming substances to concentrate to ores. Fe (siderite), Cu, Pb, Zn, S and Mn ores were formed mainly by syngenetic sedimentation and secondarily by hydrothermal superimposition, while W, Bi, Mo, rare and dispersed element ores, are mainly of endogenic origin and secondarily of syngenetic sedimentary origin. So the stratiform polymetallic deposit in this area is genetically assigned to the "diplogenetic" type.

AUTHOR: SHEN Yuanren [3088 6678 0088]

ORG: Geological Team No 9, Yunnan Bureau of Geology

TITLE: "On the Characteristics and Genesis of the Hamubaizu Siderite Deposit"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 4, 1981 pp 341-348

TEXT OF ENGLISH ABSTRACT: This deposit is situated between the exploration lines A40 and A49 in the eastern Dahongshan Fe(Cu) ore field of Yunnan Province. Its length from east to west is over 900 m, and its width is about 400 m from south to north.

The deposit, generally with one to three ore beds, occurs in a series of sodium-rich volcanic-sedimentary metamorphic rocks called the Manganghe Formation in the Lower Proterozoic (?) Dahongshan Group. The country rocks are dolomitic marble intercalated with biotite albite schist. Since they are far away from the submarine volcanic center, the sedimentary environment and facies may be favorable for the formation of siderite.

The ores consist mostly of siderite, magnetite, chalcopyrite and pyrite. The gangue minerals are dolomite, albite, etc. Since siderite is rich in Mn and Mg, it is classified as manganese magnesian siderite. The ores possess a fine-median

[Continuation of DIZHI LUNPING Vol 27 No 4, 1981 pp 341-348]

crystalloblastic texture and ribbon-formed, banded or massive structure.

In the metallogenetic zone, as a whole, the tuffaceous and argillaceous facies change gradually to the carbonate facies from west to east. In accordance, the ore type changes gradually from magnetite-chalcopyrite to the Cu-bearing siderite, so that the ore deposits gradually evolved from the magnetite-chalcopyrite type to the siderate one.

This siderite deposit is an essential member of the submarine volcanic metallogenic series in this region. Together with the Fe-Cu deposits, they all occur around an old volcanic center and appear to be controlled by the volcanic mechanism, volcanic cycle, lithological character, lithofacies and stratigraphical horizon during their formation. According to the geological setting of the deposit and the sulfur isotope values, it seems to belong to the volcanic exhalative sedimentary-metamorphic transformed origin.

9717
CSO: 4009/479

AUTHOR: LI Jun [2621 6874]
LI Libin [2621 0448 2430]
WU Zhenhua [0702 2182 5478]
et al.

ORG: All of the Wuhan Physics Institute, Chinese Academy of Sciences

TITLE: "Observation of the Ionospheric Total Electron Content during the Solar Eclipse of 16 February 1980"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 24 No 3, 1981 pp 252-256

TEXT OF ENGLISH ABSTRACT: In this paper, results of the TEC measurement by 136 MHz beacon of ETS-II during the solar eclipse of 16 February 1980 at Heqing Station (100°12'E, 26°35'N) are discussed. The eclipse produces a premature sunset without any bite-out on the TEC curve during the course of the eclipse. However, it is indicated by the nonlinear relationship between TEC and N_B (the underlying electron content below F_2-layer peak) that N_B makes relatively smaller contribution to the measured Faraday rotation around the eclipse maximum. These results imply that for a near sunset eclipse, its dynamic effect on the ionosphere is very marked and its photochemical effect is restricted in the lower ionosphere. No gravity wave can be associated immediately with the eclipse, although quasi-periodic disturbances of very small amplitude can be seen on the residual curve of TEC after the running mean has been removed.

AUTHOR: TAN Zixun [6223 1311 0534]
HUANG Xinyu [7806 0207 2246]

ORG: Both of the Wuhan Physics Institute, Chinese Academy of Sciences

TITLE: "The Behavior of F_2 Layer above Ruili during the Solar Eclipse of 16 February 1980"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 24 No 3, 1981 pp 257-262

TEXT OF ENGLISH ABSTRACT: The morphology of the F_2 layer during the solar eclipse is examined, and the mechanism of its formation is discussed theoretically. It is found that there are three different types of electronic density behavior in the F_2 layer. Correspondingly, this layer can be divided into three regions according to the relative effects of photochemistry and dynamics. The authors consider that the thermal contraction of the ionospheric plasma produced by the change of the electronic temperature may be the principal cause of the morphological behavior of the F_2 layer during this solar eclipse.

AUTHOR: ZHANG Xunjie [1728 6064 2750]
XIONG Nianlu [3574 1628 4389]

ORG: Both of the Department of Space Physics, Wuhan University

TITLE: "Ionospheric E Region Instabilities Produced by Solar Eclipse"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 24 No 3, 1981 pp 263-268

TEXT OF ENGLISH ABSTRACT: This paper gives the results of observation of the total solar eclipse of 16 February 1980, obtained by using a HF Doppler Sounder. In the period of the solar obscuration, three pronounced perturbations of the ionospheric E region were observed and, after the third contact, two perturbations were also observed. The main characteristics of the perturbations can be explained by the variations of the ionizing sources which were located in the solar active region. The highly correlated relations between the prompt variation of the solar active regions and the short-period perturbation of the ionospheric E region are shown. It is concluded that the prompt variation of the solar active regions is one of the important causes producing the ionospheric E region instabilities.

AUTHOR: LIU Changfa [0491 7022 4099]
HUANG Heling [7806 7729 7881]
AN Zhenchang [1344 2182 2094]
WANG Yuehua [3769 2588 5478]
WANG Xingli [3769 5281 3810]
LI Jin [2621 6855]

ORG: LIU, HUANG, AN, WANG Yuehua and LI all of the Institute of Geophysics, Chinese Academy of Sciences; WANG Xingli of the Institute of Geochemistry, Chinese Academy of Sciences

TITLE: "Analysis of the Geomagnetic Effect during the 16 February 1980 Solar Eclipse in Yunnan Province"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 24 No 3, 1981 pp 269-278

TEXT OF ENGLISH ABSTRACT: Three component (HDZ) normal and quick run (HD) records of the earth's magnetic field were made at Ruili, Yunnan Province, during the total solar eclipse of 16 February 1980. Daily variation, small disturbance and magnetic pulsation were analyzed. There was a change of $-0.8' \pm 0.2'$ in D and $-2.9 \pm 1.6\gamma$ in H. The amplitude ratio of small disturbances was decreased. These changes are consistent with the change in electron density in the E layer during the eclipse.

AUTHOR: QI Guizhong [4359 6311 0112]
HOU Zuozhong [0230 0155 0022]
FAN Guohua [5400 0948 5478]
et al.

ORG: All of the Institute of Geophysics, State Seismological Bureau

TITLE: "On the Seismo-magnetic Induction Effect (II)"

SOURCE: Beijing DIQIU WULI XUEBAO [ACTA GEOPHYSICA SINICA] in Chinese Vol 24 No 3, 1981 pp 296-309

TEXT OF ENGLISH ABSTRACT: The numerical theory of the three-dimensional electromagnetic induction is a powerful tool in studying the seismo-magnetic induction effect, as well as the lateral inhomogeneity of the electrical structure in the earth's crust and upper mangle. The complete numerical equations were established in our previous paper. In this paper we first show both theoretically and numerically the uniqueness, convergency and stability of the solution of these equations under definite conditions. Then, some model calculations are carried out for various periods of source field and burying depths of local anomalous bodies to study the space-distribution and frequency characteristics of the seismomagnetic induction effect. Under the assumptions that the dimension of the anomalous body corresponds approximately to the source dimension of an earthquake of magnitude 5-7, and that its conductivity is 10 times as large as the normal value, the results

[Continuation of DIQIU WULI XUEBAO Vol 24 No 3, 1981 pp 296-309]

for a source period of a few seconds to a few minutes show that the largest anomaly, relative variation about 30 percent, of the horizontal component takes place in the central part above the anomalous body, and that the largest anomaly, relative variation 50 percent, of the vertical component takes place at the two sides perpendicular to the direction of the source field. Therefore, observing the anomalies of short period variations of the field might be a promising approach to monitoring conductivity variations associated with the earthquake process. The anomalous intensity of the seismo-magnetic effect, however, decreases quite rapidly with distance, so that the observing sites have to be near the earthquake source region, and this brings about the difficulty for their arrangement in advance.

9717
CSO: 4009/481

Seismology

AUTHOR: CHENG Erlin [2052 1422 2651]

ORG: Seismological Bureau of Sichuan Province

TITLE: "Recent Tectonic Stress Field and Tectonic Movement of Sichuan Province and Its Vicinity"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 3, 1981 pp 231-241

TEXT OF ENGLISH ABSTRACT: This paper deals with the P-wave initial motion solutions of 76 earthquakes of magnitude greater than 5 which occurred in Sichuan Province during 1933-1978. It discusses the particular features of the recent stress field in each separate region and their relations to the recent tectonic movement of the neighboring regions and to plate tectonic theory. In combination with the results of geological and seismological field observations, the character of recent tectonic movement of the principal fracture systems of Sichuan Province has also been discussed. Finally it is pointed out that, if we assume a rotation of the Tibet-Qinghai-Sichuan block from SEE toward SE to SSE, the principal features of the recent tectonic stress and tectonic movement of Sichuan Province, or even all of western China, can be explained.

AUTHOR: HUANG Deyü [7806 1795 3842]
FENG Hao [7458 3185]

ORG: Both of the Analysis and Prediction Center, State Seismological Bureau

TITLE: "Time and Space Scanning of Parameters of Seismicity over a Broad Region Before Strong Earthquakes"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 3, 1981 pp 283-291

TEXT OF ENGLISH ABSTRACT: Before strong earthquakes, certain anomalous features may show up in the seismicity of a broad region, possibly caused by the concentration of stress and the ensuing anelastic deformation at the source region of the earthquakes. Certain parameters of seismicity with rather obvious physical meanings and supported by the results of rock fracture experiments are selected for the study, namely the areal extent A of the seismic active area, seismic energy released $\bar{E}$, accumulative numbers ΣN of earthquakes and the value b of large and small earthquakes, etc. A method of scanning has been adopted to first search for the dangerous location under which a strong earthquake is in the process of development and then apply time scanning to show further the transition from medium to medium-short range of anomalous features of seismic activity before the occurrence of a large earthquake.

[Continuation of DIZHEN XUEBAO Vol 3 No 3, 1981 pp 283-291]

Based on scanning of the observed seismicity data of north China, southwest China and northeast China before several large earthquakes, emphasis has been laid on the anomalous seismic feature of north China before the 1976 Tangshan earthquake of magnitude 7.8. The paper also discusses the different roles played by the parameters of seismicity in medium-term prediction of strong earthquakes. It is believed that such a method of time and space scanning, particularly of the b value, has certain significance in medium-term earthquake prediction.

AUTHOR: None

ORG: None

TITLE: "Committee on Earthquake Engineering Formed Under the Chinese Seismological Society"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 3, 1981 pp 331-334

TEXT OF ENGLISH ABSTRACT: On 23 March 1981, a committee on earthquake engineering was organized under the Chinese Seismological Society. Professor Liu Huixian has been elected as the chairman of the committee.

The Chinese Seismological Society announced this new organization at a scientific meeting held in Nanjing. More than 80 scientists, engineers and leading members from research institutes and universities attended the meeting. About 50 papers were read at the symposiums.

9717
CSO: 4009/480

Seismology and Geology

AUTHOR: YING Sihuai [2019 1835 3232]
YU Libao [0205 3810 1405]
YANG Zhuen [2799 0031 1869]

ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "The Metamorphism and Genetic Problems of Eclogites from Hongtushan and Qinglongshan Mountains of the Donghai Region, Jiangsu Province"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 17-30

TEXT OF ENGLISH ABSTRACT: This paper deals with the mineralogical and petrological features of eclogites from Hongtushan and Qinglongshan mountains of the Donghai Region, Jiangsu Province. According to the experimental results of related rocks, the genetic condition of eclogites can be estimated as $T = 890-1275$°C and $P = 17.25-24.75$ kb, at a depth of 50-70 km. From the petrochemical characteristics, the parent rock of eclogites can be considered as tholeiitic basalt. It can be assumed that the evolutionary of eclogites in the studied region started with the metamorphism of tholeiitic basalt into basic granulite, and then the basic granulite further turned into eclogite due to the dynamic process of progressive metamorphism. This process can be expressed by means of 0.61 hypersthene + plagioclase ($An = 61$) = Omphacite ($Jd = 39$) + 0.61 kyanite + quartz. Finally, the eclogites accompanied by the faulting intruded into the supracrustal migmatitic gneisses. In this process

[Continuation of DIZHEN DIZHI No 3, Sep 81 pp 17-30]

the temperature decreased from 1080°C±190°C to 750°C±80°C, and the pressure from 21.0 kb ± 3.75 kb to 4.0 kb ± 2.5 kb. It follows that the sequent retrogressive metamorphism of eclogites was caused by the dynamic effect of faulting. The conditional formula of this dynamic metamorphism can be approximately expressed as $P(\text{kb}) = 0.0506T(\text{C}) - 33.65$.

AUTHOR: PENG Gui [1756 6311]
JIAO Wenqiang [3542 2429 1730]
LI Daming [2621 1129 2494]
LI Guiying [2621 2710 5391]

ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "Division and Correlation of the Late Quaternary Stratigraphy and Discussion on the Recent Tectonic Movement in the Region of the Luanhe River Delta"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 31-36

TEXT OF ENGLISH ABSTRACT: Based on the field investigations and C^{14} datings of 25 specimens, the problems with the division and correlation of the Late Quaternary stratigraphy and the recent tectonic movement in the region of the Luanhe River delta are discussed. The studies indicate that the three incised alluvial fans of the Luanhe River were formed during about 18,000, 11,000 and 6,000-3,000 years BP, respectively. In the northern coast of the Bohai Bay, there was a transgression during the Middle Holocene. The ages of three ancient coastlines are of about 5500, 3700 and 350 years respectively. The largest subsidence amplitude is of about 10 m (Jianggezhuang). Due to the difference in subsidence rate of the east and west parts of the newest delta of the Luanhe River, the course of the Luanhe River continuously migrated eastward since the Middle Holocene.

AUTHOR: ZANG Shaoxian [5258 4801 0341]

ORG: Department of Geophysics, Beijing University

TITLE: "Earthquake Faulting and Stress Field"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 37-46

TEXT OF ENGLISH ABSTRACT: The relationship between the earthquake faulting and tectonic stress was considered in this paper. The results of the earthquake mechanism were reviewed. It shows that the fault plane obtained from the fault plane solution agrees well with the surface break caused by the earthquakes, but the fault plane solution does not give a good explanation for the orientation of stress. In addition, an earthquake may be a complex rupture process and the onset of ρ waves just reflects the initial state of this process.

The Coulomb criterion for rock failure was applied to investigate the earthquake faulting. It shows that the angle between the faulting plane and the greatest principal stress is less than or equal to $\pi/4$ in the homogeneous and isotropic materials, and the result obtained from the fault plane solution can be regarded as as special case for them with $\mu = 0$, i.e., no friction exists. When the material contains preexisting faults or weakened zones, the angle may be distributed in a

[Continuation of DIZHEN DIZHI No 3, Sep 81 pp 37-46]

wide range. It depends on the fracture parameters of the material, such as So, Sw, μ, μ_w, as well as the intermediate principal stress. Five basic processes of the stress changes which may cause earthquakes are discussed in this paper.

AUTHOR: WEI Menghua [7614 1125 5478]
WANG Qiming [3769 0796 7686]
SHI Zhihong [0670 1807 1347]
et al.

ORG: All of the Institute of Geology, National Bureau of Seismology

TITLE: "A Preliminary Study of the Free Air Gravity Field in the Chinese Continent"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 47-60

TEXT OF ENGLISH ABSTRACT: Based on the measured ground data, 10 free air gravity maps of China have been constructed from mean free air values in square areas of 1° x 1° to 10° x 10° using an average filter to eliminate successively the shorter wavelengths. These results indicate a great difference between east China and west China in the anomaly configuration: the anomaly value changes are gentle in the east and sharp in the west; the short wavelength anomalies trend in a NE direction in the east and NW in the west, whereas the long wavelength anomalies trend in a NS direction in the east and EW in the west. In addition, there are four NW disturbance zones cutting across the NE linear anomalies in the east. From map 1 (1° x 1°), it can be seen that in the east there exist two prominent nearly parallel positive anomaly zones, one of which extends from the Changbaishan mountains through

[Continuation of DIZHEN DIZHI No 3, Sep 81 pp 47-60]

the Liaoning and Shandong peninsulas into the coastal ranges in Zhejiang and Fujian provinces, and the other runs from the Dahingganling mountains along the Taihangshan mountains through the Qinling mountains into the ranges of western Hubei and Hunan provinces. Between the two zones exists a wide and low gravity anomaly zone associated with the Songliao, North China and Jianghan plains and Hengyang basin. In the west, the anomaly configurations are very complex and have the same NW direction as the positive linear anomalies over the Qilianshan mountains, the eastern Tianshan and the Altayshan. On map 2 (3° x 3°) are shown the high-amplitude positive anomalies for almost all the mountain regions and the low-amplitude positive or negative anomalies for all the plains and plateaus, whereas the interior basins always correspond to the large high-amplitude negative anomalies. On map 3 (5° x 5°) can be found five dominant large anomalies for the Chinese continent: the positive from 110°E to the east, the negative over the Sichuan basin and Ordos plateau, the positive over the Qinghai and Xizang region, the negative over the Nei Monggol and Xinjiang Autonomous Regions. In addition, a great negative anomaly appears in eastern Xizang. As shown on maps 4 and 5 (7° x 7° and 9° x 9°), the direction of the main linear anomalies turns into a normal NS one in east China and EW in the west. It is suggested that the short wavelength anomalies (1° x 1°) associated with the tectonic features are produced due to successive tectonic movements causing the nonhomogeneous mass distribution in the lithosphere. The moderate wavelength anomalies (3° x 3° and 5° x 5°) resulted from the broad bent of the lithosphere caused by the current stress from plate motions. Probably the long

[Continuation of DIZHEN DIZHI No 3, Sep 81 pp 47-60]

wavelength anomalies (7° x 7° and 9° x 9°) are related to the mantel deep-seated mass inhomogeneity, except the effect of the plate motions. The relation of the above-stated phenomena to the tectonic framework, isostasy and seismicity as well as the possible geodynamical process are also discussed.

AUTHOR: LI Zuwu [2621 4371 2976]

ORG: Institute of Seismology, National Bureau of Seismology

TITLE: "The Relation Between the Reservoir Induced Earthquakes and Geologic Structures"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 61-69

TEXT OF ENGLISH ABSTRACT: There are many cases showing that reservoir induced earthquakes have a very close relationship with geologic structures. This paper discusses the relationship of reservoir induced earthquakes with the intensively active geotectonic area, the fractured zone and differential movement among blocks in the light of data obtained in practical work.

As is well known, reservoir induced earthquakes are closely related to geotectonic conditions. Usually this kind of shock occurs in strongly active geotectonic areas, such as the Cenozoic geosynclinal folding zone and Diwa region, especially in the arcuate inflection points of an active fault or at the intersection of several groups of structural lines where the neotectonic differential movement was evidently caused. By means of triangulation and leveling it is suggested that the reservoir induced earthquakes also occurred at the tectonic junction of blocks (horst and graben) which are tectonically active to a certain extent at present. Moreover, it is a portion in which the stress, particularly the tensile or shearing stress, is easily concentrated.

AUTHOR: ZHU Shulian [2612 3219 5571]

ORG: Institute of Geology, National Bureau of Seismology

TITLE: "Mathematico-statistical Prediction of Liquefaction of Soil during an Earthquake"

SOURCE: Beijing DIZHEN DIZHI [SEISMOLOGY AND GEOLOGY] in Chinese No 3, Sep 81 pp 71-82

TEXT OF ENGLISH ABSTRACT: The 1976 Tangshan earthquake (M=7.8) caused extensive soil liquefaction in the broad Beijing-Tianjin-Tangshan plain region, resulting in severe damage. For this reason we have to estimate whether the liquefaction could happen during future shocks, which would be an important basis on which to propose measures of reduction of seismic hazards. As is well known, the engineering construction is in urgent need of the comprehensive prediction of liquefaction. Usually the conventional geological or experimental methods could only give predictable indicates in the cases of simple and fewer factors. This paper statistically predicts soil liquefaction based on the measured and tested data during the engineering exploration.

Using the method of stepwise discrimination analysis of Beyes' criterion, 13 and 15 variances selected from the liquidated and unliquidated localities can be used as

[Continuation of DIZHEN DIZHI No 3, Sep 81 pp 71-82]

correlation calculations in five ways. The variance pattern with the highest accuracy and confidence is chosen to predict the liquefaction at a location of level VIII in intensity. The five kinds of prediction are in close agreement and can prove each other. In addition, the maximum probability posterior of grouped samples is mostly above 0.99, with high confidence. In such a case, the extrapolated results are reliable.

9717
CSO: 4009/475 END

JPRS 79222

15 October 1981

China Report

SCIENCE AND TECHNOLOGY

No. 131

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79222

15 October 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 131

CONTENTS

ABSTRACTS

AUTOMOTIVE ENGINEERING

QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] No 3, 1981 1

BIOCHEMISTRY

SHENGWU HUAXUE YU SHENGWU LIXUE BAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] No 2, Jun 81 4

BIOLOGY

SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] No 2, Jun 81.. 6

COMPUTER TECHNOLOGY

DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] No 7, 1981 10

ELECTRIC POWER

DIANLI JISHU [ELECTRIC POWER] No 9, Sep 81 12

ELECTRONICS

WUXIANDIAN [RADIO] No 8, 11 Aug 81 14

GEOLOGY

DIZHI XUEBAO [ACTA GEOLOGICA SINICA] No 3, 1981 16

HYDRAULIC ENGINEERING

SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] No 4, 1981 19

MECHANICS

LIXUE XUEBAO [ACTA MECHANICA SINICA] No 4, 1981 22

METEOROLOGY

DAQI KEXUE [SCIENTIA ATMOSPHERICA SINICA] No 3, Sep 81 29

METROLOGY

JILIANG XUEBAO [ACTA METROLOGICA SINICA] No 3, 1981 30

MILITARY MEDICAL RESEARCH

JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] No 4, Aug 81 37

OCEANOLOGY

SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] No 3, 1981 39

OIL AND GAS GEOLOGY

SHIYOU YU TIANRANQI DIZHI [OIL AND GAS GEOLOGY] No 2, Jun 81 41

SEISMOLOGY

DIZHEN YANJIU [JOURNAL OF SEISMOLOGICAL RESEARCH] No 2, 1981 43

TELECOMMUNICATIONS

DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] No 5, 1981 46

ZOOLOGY

DONGWUXUE YANJIU [ZOOLOGICAL RESEARCH] No 2, May 81 47

AUTHOR: None

ORG: First Automobile Works

TITLE: "Raising Compression Ratio with a New Type of Carburetor for a L-head Gasoline Engine to Raise Its Fuel Economy"

SOURCE: Beijing QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] in Chinese No 3, 1981 pp 1-8

TEXT OF ENGLISH ABSTRACT: With the availability of higher octane gasoline (from 66 to 70 MON), a widely-used L-head gasoline truck engine was modified to improve its performance. The compression ratio was raised from 6.0 to 6.4 so that power output was raised by 5 percent and maximum torque by 1.35 percent, with fuel consumption reduced by 1.86 percent. For further reduction of fuel consumption a new type of carburetor with smaller venturi tube was developed, aiming at maintaining the original power and torque while reducing fuel consumption. Engine bench tests showed that the minimum fuel consumption at WOP was reduced by 9.21 percent. Subsequent road tests proved that there is no noticeable difference between the truck with the improved engine and the original one in acceleration and maximum speed, but fuel consumption both in constant speed tests and service was reduced by more than 10 percent.

For further raising compression ratio and power output or lowering fuel consumption, a new aluminum alloy head is not under development.

AUTHOR: LU Chengqiao [4151 2052 9438]

ORG: Petrochemical Engineering Institute

TITLE: "Some Problems with Automotive Fuels and Lubricants"

SOURCE: Beijing QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] in Chinese No 3, 1981 pp 9-15

TEXT OF ENGLISH ABSTRACT: In this paper some problems with the effect of automotive fuels and lubricants on energy conservation were raised. The state of the art and existing problems of fuel qualities, including gasoline octane number, were discussed. The test methods and instrumentation of engine lubricants were also introduced.

AUTHOR: YIN Dekui [1438 1795 7608]

ORG: Changchun Automotive Research Institute

TITLE: "The Existing Status of Exhaust Emission of Three Gas-engine Trucks and Their Remedies"

SOURCE: Beijing QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] in Chinese No 3, 1981 pp 16-32

TEXT OF ENGLISH ABSTRACT: Three gas-engine trucks' exhaust emission was tested and analyzed. Some measures were given to reduce the exhaust emission, generally and individually.

AUTHOR: ZHU Qian [2612 0241]

ORG: Qinghua University

TITLE: "Methods for Determining the Nominal Power of Automotive Diesel Engines"

SOURCE: Beijing QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] in Chinese No 3, 1981 pp 33-39

TEXT OF ENGLISH ABSTRACT: Comments on the national standard for testing automotive diesel nominal power were given and some questions were raised. Some critical factors and ambient conditions affecting engine nominal power were isolated. Finally, correction formulas were also given.

AUTHOR: SUN Kainan

ORG: None

TITLE: "The Use of Programmable Calculators"

SOURCE: Beijing QICHE GONGCHENG [AUTOMOTIVE ENGINEERING] in Chinese No 3, 1981 pp 40-49, 15

TEXT OF ENGLISH ABSTRACT: In this paper some explanations are given as to the use of programmable calculators. Some examples, especially ones of automotive engineering, are also given. The author also broadens his view by describing how the calculators of this type can be used for control purposes. Finally, these calculators can be used in factories, design offices and research institutes solving most of the calculation problems.

9717
CSO: 4009/13

AUTHOR: QIN Wenbin [4440 2429 2430]
LIANG Youzhen [2733 0645 3791; deceased]

ORG: Both of the Department of Hemoglobin, Baotou Medical College, Baotou

TITLE: "Hemoglobin A_2 Phenomenon. I. Discovery and Preliminary Application of this Phenomenon"

SOURCE: Shanghai SHENGWU HUAXUE YU SHENGWU LIXUE BAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 2, Jun 81 pp 199-204

TEXT OF ENGLISH ABSTRACT: 1. A natural phenomenon discovered in our laboratory is here tentatively described as "Hemoglobin A_2 Phenomenon."
2. HbA_2 of hemolysate differs from "HbA_2" of RBC in their electrophoretic behavior, which is the main feature of the "HbA_2 Phenomenon."
3. When erythrocytes from normal adults were run parallel to their hemolysates in thin layer starch gel electrophoresis, it was found that HbA and carboanhydrase from the above two sources have identical electrophoretic positions, only "HbA_2" of erythrocytes differs from HbA_2 of hemolysates in that "HbA_2" moves faster to the anode than does HbA_2.
4. HbF, HbN-Baotou, HbD-Baotou and HbE do not show the above described difference between erythrocytes and hemolysates and do not show the "HbA_2 Phenomenon."
5. The mechanism of "HbA_2 Phenomenon" is not yet clarified, but its preliminary application has been found. It is known that HbE has identical or similar

[Continuation of SHENGWU HUAXUE YU SHENGWU LIXUE BAO No 2, Jun 81 pp 199-204]

electrophoretic behavior and chromatographic properties as does HbA_2, but their differentiation is difficult. Now the "HbA_2 Phenomenon" may be used to distinguish HbE from A_2. As mentioned above, HbA_2 shows the "HbA_2 Phenomenon," while HbE does not.

AUTHOR: CHEN Yuancong [7115 6678 5115]
WU Xiangfu [2976 4382 4395]
ZHANG Jingkang [1728 2529 1660]
JIANG Mingshi [3068 2494 1853]
XU Ke [1776 4430]

ORG: CHEN and WU both of the Shanghai Institute of Biochemistry, Chinese Academy of Sciences; ZHANG, JIANG and XU all of the Shanghai Institute of Physiology, Chinese Academy of Sciences

TITLE: "Further Purification and Biochemical Properties of Presynaptic Neurotoxin from the Snake Venom of Agkistrodon halys Pallas"

SOURCE: Shanghai SHENGWU HUAXUE YU SHENGWU LIXUE BAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 2, Jun 81 pp 205-212

TEXT OF ENGLISH ABSTRACT: Agkistrodotoxin, a presynaptic neurotoxin and one of the two neurotoxins from the snake venom of Agkistrodon halys Pallas, has been further purified by DEAE-cellulose and CM-Sephadex column chromatography and vertical slab polyacrylamide gel electrophoresis. A homogeneous neurotoxin was obtained which showed a single band at either alkaline or acidic pH. This protein consists of 121 amino acid residues and the molecular weight estimated from the results of quantitative amino acid analysis is 13,700, a value quite near to that determined by SDS-polyacrylamide gel electrophoresis of 13,400. Its N-terminal is asparagine and C-terminal is serine. The purified neurotoxin exhibits phospholipase activity 11 times that of the crude venom.

9717
CSO: 4009

AUTHOR: LI Ming [2621 2494]
XU Luxia [1776 7216 7209]
LI Wenyu [2621 2429 5940]

ORG: All of the Shanghai Institute of Cell Biology, Chinese Academy of Sciences

TITLE: "Isolation and Purification of Alpha-fetoprotein Messenger RNA From Rat Transplantable Hepatoma BERH-2"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 2, Jun 81 pp 145-152

TEXT OF ENGLISH ABSTRACT: Messenger RNA coding for alpha-fetoprotein (AFP) was isolated and purified from rat transplantable hepatoma BERH-2 by indirect immunoprecipitation of AFP-synthesizing polysomes followed by poly (U)-Sepharose affinity chromatography of poly (A)-containing mRNA. The purified AFP mRNA migrated as a single band at 22 S on a gel of 2 percent polyacrylamide - 0.5 percent agarose. In wheat germ extract, the AFP mRNA directed the synthesis of a protein, which was identified as authentic AFP by means of double antibody immunoprecipitation and gel electrophoresis, with 95 percent nascent AFP peptide migrating along with carrier AFP. The translation product in wheat germ system under optimal conditions indicated that the AFP mRNA was purified as high as 54-fold more than the original AFP polysomal RNA.

[Continuation of SHIYAN SHENGWU XUEBAO No 2, Jun 81 pp 145-152]

DNA complementary to the AFP mRNA (AFP^{3}H-cDNA) was synthesized with avian myeloblastosis virus revers transcriptase (a generous gift from Professor P.H. Hofschneider, Max-Planck-Institute für Biochemie, West Germany). The fidelity of the AFP cDNA transcript was determined by analyzing thermal denaturation of AFP mRNA, AFP^{3}H-cDNA hybrids. A sharp melting profile was obtained with a Tm of 89°C, suggesting that the cDNA was a faithful copy of AFP mRNA.

AUTHOR: ZHANG Jingbo [1728 7234 3134]
WANG Ruizhen [3769 3843 3791]

ORG: Both of the Department of Cell Biology, Cancer Institute, Chinese Academy of Medical Sciences, Beijing

TITLE: "An Observation of In Vitro Invasiveness of Human Cancerous Cell Lines"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 2, Jun 81 pp 153-157

TEXT OF ENGLISH ABSTRACT: A simple confrontation culture method was described. Cell suspensions of two human cancerous cell lines and diploid human fetal lung cells and baby golden hamster fibroblasts were prepared and subcultured in culture flasks in a 30 degree sloping position. Twenty-four hours later, the supernatants were discarded and the attached cells washed twice with Hanks' solution. The embyronic chick hear muscle was then explanted in the flask about 1 mm in front of the top line of the attached cells. The culture flasks were placed horizontally four hours later. After 24-48 hours incubation the cultures were fixed and stained for observation.

The results showed that, under such circumstances, human hepatoma cell line BEL-7402 and human esophageal cancer cell line ECa-109 invaded the area of the embryonic chick heart muscle fibroblasts and formed cancer cell islands among them,

[Continuation of SHIYAN SHENGWU XUEBAO No 2, Jun 81 pp 153-157]

while the embryonic chick heart muscle fibroblasts went aside as if to avoid contact with the malignant cells, or stopped growing and ceased to divide as they were confronted with BEL-7402 cells or ECa-109 cells. On the other hand, when normal diploid human fetal lung cells or baby golden hamster lung cells came into contact with the embryonic chick heart muscle fibroblasts, they did not invade the latter. They simply changed their direction of growth. Since the in vitro behavior of human malignant cells was different from that of human fetal lung cells and that of baby golden hamster lung cells as described in this paper, it is possible that the in vitro invasiveness might be considered an important feature characteristic of human malignant cells.

AUTHOR: LIANG Suxiang [2733 4790 7449]
PANG Shiyi [1690 6108 1355]
DONG Ronghua [5516 5554 5363]
et al.

ORG: All of the Shanghai Institute of Cell Biology, Chinese Academy of Sciences

TITLE: "Radioimmunoassay of Serum Concentrations of Testosterone and LH in Male Rats Administered with Gossypol"

SOURCE: Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese No 2, Jun 81 pp 191-197

TEXT OF ENGLISH ABSTRACT: It has been reported that about 6 percent of volunteers administered gossypol complained of decreasing libido. However, serum testosterone and LH level measured in part of the volunteers was not in accordance with their complaints. Even when the volunteers felt libido decreasing, the serum concentrations of testosterone were still in the normal range. In addition, the small amount of information obtained from animal experiments suggested that gossypol did not affect the serum concentrations of the testosterone and LH in male rats. Clinically this phenomenon has not been interpreted. However, testes atrophy was revealed in rats and in men administered gossypol on a long term basis. It should be studied whether testicular degeneration is caused by decreasing of testosterone or not.

[Continuation of SHIYAN SHENGWU XUEBAO No 2, Jun 81 pp 191-197]

With radioimmunoassay, the serum concentration of testosterone and LH was determined in immature and mature rats (Wistar strain with known birthdays) after treatment with gossypol. The experiments were divided into several groups as follows: The first group, immature rats of 30 days of age, were treated with gossypol at a dosage of 20 mg/kg body weight, five times a week for two months; the second, immature rats also, were treated under the same conditions as those in group one, but the drug was withdrawn after one month; the third, mature rats, were administered gossypol of 5 mg/day five times weekly for one month and six months. Untreated normal immature and mature rates of the same ages were used as controls for each group. The animals in each group were sacrificed on time, and blood samples were collected separately. For comparison with themselves, mature rats were treated with gossypol monthly and then withdrawal for a month, with blood being collected by cardiac puncture before and after treatment.

Serum testosterone was measured by Corker's method (1978) without chromatography. Serum LH was determined by Niswender's ovine-ovine method (1968), using NIH-LH-S 18 as the reference standard. The purified ovine LH 2-2-1 was labelled with ^{125}I by Greenwood's method (1963), and the purification of ^{125}I-LH2-2-1 was performed by Wang's method (1979).

The results indicate that serum concentrations of testosterone decreased significantly ($P<0.025$) in immature and mature rats by gossypol treatment for different time intervals, and the evocation of testosterone levels was not found after

[Continuation of SHIYAN SHENGWU XUEBAO No 2, Jun 81 pp 191-197]

cessation for a month. However, there was no change in serum level of LH in all groups. The decrease of testosterone is not connected with the body weight and testis atrophy. It was concluded that the decrease of serum testosterone might be due to a direct effect exerted by gossypol on Leydig cells, and the accumulation of gossypol in the testes might result in the concentration of testosterone being maintained at a lower status.

9717
CSO: 4009/492

AUTHOR: LI Wenliang [2621 2429 5328]

ORG: Yunnan Provincial Bureau of Geology

TITLE: "Voice Recognition and Synthesis Technology"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 7, 81 pp 43-50

ABSTRACT: Traditional methods of man-machine interface all have various shortcomings, so the goal of man-machine conversation is important. Following advances in integrated circuit technology and speech information processing this ideal has become reality. Many countries have been doing research in speech recognition and speech synthesis. Speech recognition began in the 1950's when Davis et al experimented on the recognition of the digits 0 -9. Different speakers produce different sounds, but by means of speech frequency analysis we find that the resonance peaks (characteristic frequency constituents) of similar sounds are similar. Davis et al using 900 Herz as a boundary used a two channel filter, but the recognition rate was low. Now as many as 20-30 filters are used. The PARCOR(partial autocorrelation) method developed in Japan involves connecting points to obtain a curve which shows the characteristics of the frequency spectrum. Recent speech recognition developments have involved such things as translation machines. The Japanese IQ-3000 has a five language translation capability and translates 5000 common words. Artificial speech synthesis started in 1779. The

[continuation of DIANZI JISUANJI DONGTAI No 7, 81 pp 43-50]

first electrical apparatus was produced in 1902. In the 1950's speech synthesis based on recording appeared. Current research is based on using digitized speech information to reproduce human speech. The PARCOR system mentioned above is also used in speech synthesis.

AUTHOR: LIU Yulin [0491 3768 2651]

ORG: Research Institute of Computer Science, Chinese Academy of Sciences

TITLE: "A Method of Testing Large Scale Computers"

SOURCE: Beijing DIANZI JISUANJI DONGTAI [COMPUTER REVIEW] in Chinese No 7, 81 pp 64-65

ABSTRACT: The design of computer accessories has advanced with the development of large scale computers, but traditional methods of testing are still used on large scale computers. These methods are costly in time and money and are very error prone, while making ever increasing demands on service consoles. This also results in a great deal of hand coded diagnostic programming, with obvious inefficiencies. Hand recording of diagnostic data is also a problem. Therefore it is necessary to find simple, easily implemented, economical, reliable and thorough testing methods which can shorten testing time. The use of efficient diagnostic programming is an important method. In this matter the simulation of computer logic is very important to guarantee that the logical design is correct before the computer, which could consist of hundreds of integrated circuits, is put together. It is also necessary to produce small scale test equipment and maintenance consoles that can be used for testing all components of a computer. This equipment allows binary signals to be sent directly to the components to be tested. The results can then be directly printed in binary or octal. With the above

[continuation of DIANZI JISUANJI DONGTAI No 7, 81 pp 64-65]

methods we have achieved rather good results. For example, a diagnostic program of 3600 lines used to test the instruction control unit was completed in ten days.

6168
CSO: 4009/499

Electric Power

AUTHOR: None

ORG: Ministry of Electric Power Industry; National Bureau of Urban Construction

TITLE: "Several Principles on the Planning and Designing of Urban and Suburban Power Supply Networks (Provisional)"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 9, Sep 81 pp 2-4

ABSTRACT: Urban power supply network includes the power supply of a metropolitan area and is responsible for supplying the power needed for the development of the national economy, culture, education, and the livelihood of the people. The power supply networks of China's cities have old equipment and backward technology and cannot meet the needs of 4 modernizations. The provisional principles are formulated for the purpose of reconstructing the urban power supply networks of the country gradually, step by step, on the foundation of the current networks to make them into safe, economical, superior quality power supply networks of advanced technology. Aside from outlining the designing objectives, requirements, etc. the paper includes discussions on the need for analyzing and computing the power needs of a city, simplifying the voltage, guaranteeing the needs of communication and automation, and standardization.This is originally a public announcement of the 2 organizations, carrying the document identification of Diansheng No 35.

AUTHOR: MA Fangli [7456 5364 4409]
SUN Junmo [1327 0689 4438]

ORG: Both of Research Institute of Electric Power Construction

TITLE: "Application of Separate Series Cooler in the No 3 HP Heater of 200 MW Steam Turbines"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 9, Sep 81 pp 9-11

ABSTRACT: In recent years, independent coolers have been adopted in such countries as W. Germany, France, the USSR, etc. in their large reheating steam turbines to improve heat efficiency and to save fuel of thermal power plants. Generally, this type of cooling is in one or 2 stages; 3 or more stages in a few cases. In China, there are now one 300MW machine made in France at Yuanbaoshan Power Plant, one 200 MW machine made by the USSR at Matou Power Plant, etc. all equipped with this type of cooler. The 300MW steam turbine produced by Shanghai Steam Turbine Plant also has this type of cooler at the 2nd and the 3rd stages. This paper introduces the design considerations and problems discussed at a meeting in 1979 called by Harbin Steam Turbine Plant for the purpose of providing Harbin Boiler Plant a finalized design to manufacture the coolers for the No 3 HP heater of the 200 MW steam turbine. In the discussion process, 10 different designs are analyzed, computed, and compared. Several different viewpoints on the subject are included in the paper.

AUTHOR: HU Guilan [5170 2710 5695]
LU Zhiye [4151 0037 6851]

ORG: None

TITLE: "Frequency Allocation Method in the Power Carrier-Current Relaying System"

SOURCE: Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 9, Sep 81 pp 44-49, 19

ABSTRACT: In a power carrier wave communication system, channels are realized by adopting the theory of frequency division. In the past, the method of interpolation is generally adopted. It may appear that with this method, frequencies may be randomly grouped, but as the power network expands, the frequencies of the system are quickly saturated while not all the frequency spectra can be fully utilized. This paper discusses the relationship between the transmission quality indices, the technical property of the carrier wave equipment, and the high frequency transmission property of the electric cable, based upon related recommendations of the IEC and the related standards of the CCITT. The method of frequency allocation was preliminarily adopted in the Beijing-Tianjin network, and the technical and economic results have been very satisfactory. This method can greatly increase the number of channels in a system, the paper demonstrates in considerable detail, while all the channels will meet the desired transmission quality.

6248
CSO: 4009/496

AUTHOR: LI Renmei [2621 0088 5019]

ORG: None

TITLE: "The CDS-1 Single Tube Color Television Camera"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 8, 11 Aug 81 p 14

ABSTRACT: The Dalian Electronic Research Institute has successfully made the CDS-1 single tube color television camera. Its technical certification has been completed and it is now being produced in small batches. Advanced techniques are incorporated and a monitoring circuit is included to observe the quality of the images through the magnetic recording tape. At the head of the camera there is a small electret microphone so that voice signals are obtained at the same time. The power supply for the camera may be either DC or AC (11.5-14V DC or 220 V AC.) The machine has both internal and external synchronism so that several cameras may be coordinated for editing. If a motor-driven lens and other electrical equipment are added, the camera may be conveniently used for remote control industrial color television. It may also be used with foreign make color video recorders for extensive applications in industry, education, medicine, scientific research, national defense, etc.

AUTHOR: SUN Benchang [1327 2609 2490]

ORG: None

TITLE: "The SR-13B 300 MHz Oscillograph"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 8, 11 Aug 81 p 14

ABSTRACT: The Liaoning Radio Plant No 2 (Dalian) has successfully made the SR-13B 300 MHz wide frequency band oscillograph. The design has been finalized and the instrument is being produced in batches. The ultra-wide band 300 MHz sensitivity is 10m V/cm; in a series system the maximum sensitivity is 1mV/cm. Being a necessary instrument for observing and recording high speed, complex pulse wave forms, the SR-13B may be extensively applied in nuclear physics research, laser technology, high differentiation radar, high speed electronic computer, color television industry, etc.

AUTHOR: TAN Detong [6223 1795 0681]

ORG: None

TITLE: "Artificial Satellite Laser Range Finder"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 8, 11 Aug 81 p 14

ABSTRACT: Artificial satellite laser range finder is used to study changes in earth's rotation, polar shift, the shape of the earth, earth's gravitation field, continental drift, etc. It is an important instrument in astrogeodynamics, geodetic survey, and seismology. The modernized range finder is a complex instrument of optics, mechanics, and electricity. It has a computer to achieve total automation in the observation process. Based upon the known orbit of the satellite, the computer guides the telescope's aim on the target and commands the laser to shoot when the telescope catches up with the satellite. The computer rectifies the results and stores the data. If the target is lost in the process of observation, the computer will immediately and automatically execute a scan and search procedure in order to renew the aiming process. The first generation artificial satellite laser range finder, a photo of which is used as the front cover of this issue of the journal, is a product of joint research by Shanghai Observatory and Shanghai Institute of Optical Machines. The instrument has been installed in the Sheshan Work Station of Shanghai Observatory. Artificial satellite laser range finders have been successively installed in Beijing, Kunming, Zhengzhou, Xian, Guangzhou, etc. in recent years to form a preliminary observation network.

6248
CSO: 4009/485

Geology

AUTHOR: YIN Hongfu [3009 7703 4395]

ORG: Wuhan College of Geology

TITLE: "Paleogeographical and Stratigraphical Distribution of the Lower Triassic Claraia and Eumorphotis (Bivalvia)"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 3, 1981 pp 161-169

TEXT OF ENGLISH ABSTRACT: Based on a worldwide review of *Claraia* and *Eumorphotis*, especially their important species, two range zones are recognized, namely, the *Cl. wangi* zone--Otoceratan, and the *Cl. aurita-Eu. multiformis* zone--Upper Otoceratan to Lower Owenitan, thus revising both the traditional Chinese concept regarding them as Lower Scythian and the viewpoints of some Eurasian researchers holding *Eu. multiformis* as Upper Scythian.

The paleogeographical distribution of the two genera is controlled primarily by temperature (latitude) and secondarily by physiographic separations. Three realms and five provinces are subdivided, among which the Eastern Asia Province of the Tethys Realm is suggested to be the source area of their development. The striking contrast between the composition of the species along the southern and northern margins of the Tethys, together with other distributional characteristics, supports the continental drift theory.

AUTHOR: LI Chunyu [2621 2504 2509]
WANG Quan [3769 4019]
LIU Xueya [0491 7185 0068]

ORG: All of the Institute of Geology, Chinese Academy of Geological Sciences

TITLE: "The Metallogeny and Plate Tectonics of China"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 3, 1981 pp 195-204

TEXT OF ENGLISH ABSTRACT: Since Phanerozoic times, four Paleo-plates have existed in China and her adjacent regions. The China plate is in the middle, the Siberian plate, including the Siberian massif and Angara-Mongolian Geosyncline along its southern margin, lies to the north, the Indian plate including the southern Tethyan Geosyncline lies to the southwest, and the Pacific plate is situated to the southeast. When they meet, three sutures are created among them, i.e., the Kelameili-Solon suture, the Yaluzangbu-Indus suture and the longitudinal valley suture of Taiwan. In addition to the above-mentioned sutures along the said four plate margins, investigations in recent years have revealed 11 main subduction zones coming into existence from Paleozoic to Cenozoic times. They are situated in the following orogenic belts respectively: the Aertai, Qilianshan, Qinling, Beitashan-Hegenshan, Tianshan, Yinshan-Tumen, Kunlunshan, Nadanhadaling, Kekexili, North Tibet-West Yunnan. This is the basic framework of plate tectonics in China.

[Continuation of DIZHI XUEBAO Vol 55 No 3, 1981 pp 195-204]

Based on the relevant tectonic and rock associations, the endogenic ore deposits of China are tentatively classified into four associations:
(1) Ore deposits in ophiolites, including chromite, nickel, platinum, asbestos and copper-bearing massive sulfide deposits, formed at the accreting plate margins near the spreading centers, are emplaced later as oceanic crustal slabs and upper mantle fragments within the orogenic belts.
(2) Ore deposits related to calc-alkali magmatic rocks, including iron, copper of contact metasomatic genesis, porphyry copper deposit containing Au, Mo and some Pb, Zn ores, are found in the overriding plates of the subduction zones along convergent plate margins.
(3) Tungsten, tin deposits and some pegmatitic deposits containing rare metals belong to the association related to anatexis acid magmatic rocks. They are always formed in the higher part of the crust. It is suggested that the uplifting of host acid magmatic rocks is due to the thickening of the sial layer at the back continental margins which coincide with intermediate-low P/T metamorphic belts.
(4) The association in alkaline or meta-alkaline rocks includes vanadium-titaniferrous magnetite, copper-nickel sulfide, rare metals and diamond. Most of these deposits occur along the rifts or deep fractures.

Based on the relations between the endogenic mineralization and plate tectonic pattern of China, four metallogenic domains can be recognized. The main features of these domains are briefly discussed separately.

AUTHOR: LI Yinqing [2621 5543 3237]
RUI Zongyao [5360 1350 3852]
CHENG Laixian [4453 5490 0103]

ORG: All of the Institute of Mineral Deposits, Chinese Academy of Geological Sciences

TITLE: "Fluid Inclusions and Mineralization of the Yulong Porphyry Copper (Molybdenum) Deposit"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 3, 1981 pp 216-231

TEXT OF ENGLISH ABSTRACT: By means of micro-heat stage, freeze stage, trace chemical analysis and polarizing microscope, the authors have studied the type, frequency, size, temperature, pressure, salinity daughter minerals, ratio of gas to liquid, revivable boiling and composition of fluid inclusions in the Yulong porphyry copper (molybdenum) deposit. From the data acquired, a series of very interesting problems, such as the character of thermal fluid, physico-chemical condition, alteration, mineralization and its possible mechanism, have been suggested.

Various minerals of the Yulong porphyry copper (molybdenum) deposit, are rich in fluid inclusions. Inclusions of different types (gaseous, liquid and poly-phase) are usually associated in the same sample or even the same mineral. In the

[Continuation of DIZHI XUEBAO Vol 55 No 3, 1981 pp 216-231]

monzonitic granite porphyry showing biotite-potash feldspar alteration, the inclusions are predominantly gaseous and poly-phase, while in the porphyry with quartz-potash feldspar and quartz-sericitization alteration is mainly poly-phase with a small amount of gaseous and liquid ones. In the altered argillic monzonitic porphyry and the altered propylitic country rock liquid inclusions predominate while gaseous and poly-phase ones are in minor amounts. Gaseous ones appear, however, to be more dominant in the country rock overlying the intrusive body. The homogeneous temperatures of the inclusions range from 600°C to 180°C; the deposition temperatures of Cu-Mo sulfides range from 420-250°C. From the center of the porphyry body to the wall rocks, the temperature of mineralization decreases gradually. The salinity of the fluid inclusions ranges from 6 to 56 wt percent, but the highly saline poly-phase inclusions are concentrated only in the region of economic mineralization. The Cu-Mo sulfides were deposited under the highly saline fluidity conditions. The pressures at the moment of homogenization are calculated to range from 100 to 1800 atm. The revivable boiling of the fluids is manifested at the top of the porphyry body by an intimate coexistence of gaseous and poly-phase inclusions.

The fluid in the inclusions belongs to the NaCl-KCl ($CaCl_2$, $MgCl_2$)-$CaSO_4$-H_2O type. As indicated by our analyses, the thermal fluids of mineralization were rich in halogen, alkaline metals, but poor in base metals, sulfur, phosphorus and so on, with very high temperature (600°C) during the initial stage. Such thermal fluids

[Continuation of DIZHI XUEBAO Vol 55 No 3, 1981 pp 216-231]

could easily have extracted the metals out of the country rocks around the tunnel through which they rose. When they arose and gathered at the top of the porphyry intrusive and its neighboring wall rocks, both alkali and hydrogen metasomatism inevitably took place with the ensuing decrease in temperature, thus giving rise to the deposition of metal sulfides.

9717
CSO: 4009/486

AUTHOR: FENG Yan [7458 8746]

ORG: Second Bureau of Hydroelectric Engineering, Ministry of Electric Power

TITLE: "A Study of the Variable Isochrone Method for Flood Computation"

SOURCE: Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 4, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This article proposes a method of variable isochrone for flood computation. It combines the advantages of unithydrograph method and isochrone. It can be used to consider both the nonlinearity and distribution of runoff. It has been applied to mountainous rivers for many years, and has achieved good results. Combining the variable isochrone for flood computation with the routing flow model of displacement and lag further improves the functions of the river storage. This model can be applied not only to mountainous rivers, but also to rivers of other regions, and thus the practical results can be improved.

AUTHOR: ZHANG Youtian [1728 2589 1131]
ZHANG Wugong [1728 2976 0501]

ORG: Both of the Water Conservancy and Hydroelectric Power Research Institute

TITLE: "The Boundary Element Method for Seepage Flow in Semi-infinite Region"

SOURCE: Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 4, 1981 pp 8-17

TEXT OF ENGLISH ABSTRACT: In this article the boundary element method for two-dimensional seepage flow in semi-infinite region is discussed. The authors propose a calculating method by using semi-infinite long element without artificially delimited calculation boundaries. The fundamental principles of the boundary element method are also briefly described and basic formulas of linearly varied elements are derived. In addition, some examples of application of the method are given.

AUTHOR: AO Lin [2407 7792]

ORG: Design Institute, Second Bureau of Hydroelectric Power, Ministry of Electric Power

TITLE: "Discussion of Boundary Conditions of the Foundation in Applying the Finite Element Method to Compute Stresses in Gravity Dam"

SOURCE: Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 4, 1981 pp 18-29

TEXT OF ENGLISH ABSTRACT: To the present time the finite element method has been one of the most effective ways to study the gravity or hollow gravity dam on a complicated foundation in engineering. The perviousness and range of foundation greatly influence the stresses caused by the hydraulic pressure on the base, including the heel and toe of the dam. In this paper, a method for selecting the boundary size and boundary conditions of the foundation when considering the foundation as impervious material is discussed. The method involves comparing the results of theoretical analysis with the results of the finite element method under the action of some typical loads. For the case of pervious foundation under seepage field, the variation of stresses related to the different foundation range and boundary conditions is discussed.

AUTHOR: YU Xiaozhong [0060 7522 0022]
JU Xiang [1446 5980]
CAO Jianguo [2580 1696 0948]

ORG: All of the Water Conservancy and Hydroelectric Power Research Institute

TITLE: "Analysis of Stability of Cracks in the Diamond Head of a Buttress Dam"

SOURCE: Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 4, 1981 pp 30-37

TEXT OF ENGLISH ABSTRACT: By using linear elastic fracture mechanics (LEFM), the study of cracks in the diamond head of a buttress dam is made in this paper. The finite element method is used to determine the stress intensity factors near the crack tip. The fracture toughness tests of concrete are performed on bend specimens under three-point loading. The nonlinear behavior of load-displacement curves and its effect on the fracture toughness are discussed. The stress intensity factors near the crack tip are obviously affected by the probable compression of contraction joints between the two buttress heads. The results of analysis indicate that this dam must urgently be strengthened.

AUTHOR: TU Chuanlin [3205 0278 2651]

ORG: Scientific Research Department, Southcentral China Hydroelectric Power Survey and Design Institute, Ministry of Electric Power

TITLE: "Fracture Analysis of Concrete Dam Heel"

SOURCE: Beijing SHUILI XUEBAO [JOURNAL OF HYDRAULIC ENGINEERING] in Chinese No 4, 1981 pp 38-50

TEXT OF ENGLISH ABSTRACT: In this paper, the approximate expressions have been found for the stress and displacement field in the vicinity of the V-notch as well as the concrete dam heel under the action of I, II and III mode loading. Then, some mixed mode fracture criteria which are applied to linear cracks in fracture mechanics are also applied and extended to the fracture analysis in the heel, and the fracture criteria under the action of various mixed mode loadings are established.

9717
CSO: 4009/6

AUTHOR: WANG Ren [3769 0088]
YIN Youquan [3009 2589 3123]

ORG: Both of Beijing University

TITLE: "On the Elasto-plastic Constitutive Equation of Engineering Rock-like Materials"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 317-325

TEXT OF ENGLISH ABSTRACT: This paper reviews the progress of elasto-plastic constitutive equations for engineering rock-like materials. Under ordinary engineering conditions, rock-like materials are brittle. Their plastic property increases with the confining pressure. In general, their macroscopic mechanical properties can be represented by elasto-plastic models. However, due to the difference in basic deformation mechanisms, some concepts in the conventional theory of plasticity have to be modified. In rock-like materials,
a. there is plastic volumetric strain, even under pure shear,
b. the plastic potential is different from the yield criterion, thus it will entail non-associated flow rule,
c. elastic modulus varies with plastic deformation, so while unloading Young's modulus will be different from its initial value,
d. we may encounter strain softening, i.e., yield surface may shrink in the stress space. It is an unstable phenomenon not covered under Drucker's postulate, but may

[Continuation of LIXUE XUEBAO No 4, 1981 pp 317-325]

be accounted for with Ilyushin's postulate.

The total (deformation) theory is first reviewed. The constitutive equation may be stated as $\sigma = D\epsilon$, with the elastic matrix D now a function of plastic strain. Equations are also given for the two mechanical parameters for isotropic cases. For the incremental theory, the constitutive equations during loading are given. In the last section the endochronic theory is briefly introduced, and its possible extension to cover rock-like materials is discussed.

AUTHOR: LIN Tongji [2651 0681 7535]
CHEN Zhongying [7115 0112 5391]
WANG Ruyong [3769 3067 3196]
et al.

ORG: All of the Institute of Mechanics, Chinese Academy of Sciences

TITLE: "Ablation Wedges and Boundary Layer Transition"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 326-332

TEXT OF ENGLISH ABSTRACT: An experimental study was carried out on the ablation wedge, the turbulent wedge on an ablating surface. An interesting phenomenon of orderly distributed ablation wedge pattern was discovered on some spherical noses of wax models as well as on those of some high temperature ablating materials. Test results indicate that this kind of phenomenon occurs at roughly the same Reynolds number and that the number of the orderly distributed wedges on a spherical nose is not affected by the nose radii and the Mach number of the free stream. Based on an analysis of the detailed surface striation of the ablation wedge, a preliminary flow model was proposed to explain the wedge distribution and its relationship with the cross-hatching ablation pattern.

AUTHOR: ZHANG Hanxin [1728 3211 0207]
YU Zechu [0151 3419 2806]
LU Linsheng [7120 2651 3932]
et al.

ORG: All of the Chinese Aerodynamic Research and Development Center

TITLE: "Numerical Solution of Supersonic and Hypersonic Laminar Separated Flow"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 333-346

TEXT OF ENGLISH ABSTRACT: Based on a filtering method with switching function, an efficient time splitting numerical scheme of first order accuracy near shock waves and of second order accuracy elsewhere is used to solve the complete Navier-Stokes equations for supersonic and hypersonic flow over two-dimensional concave corners. To simplify computation, simplified Navier-Stokes equations are developed through an analysis of the order of magnitude of physical variables in the separated flow field. Computations are performed for ramp angles varying from 0 to 20 degrees at Mach numbers from 3.0 to 14.1 and Reynolds numbers from 10^3 to 10^5 under adiabatic or cooled wall temperature. Results obtained by solving numerically the complete and simplified Navier-Stokes equations are compared with the experiments. The comparison shows that the numerical scheme presented in this paper is satisfactory and that the simplified Navier-Stokes equations are applicable.

AUTHOR: LIU Yu [0491 6877]

ORG: Northwestern Polytechnical University

TITLE: "A Transformation and Method of Solution of the Laminar Boundary Layer Equations"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 347-352

TEXT OF ENGLISH ABSTRACT: A new transformation and solution method of the laminar boundary layer equations is presented in this paper. From the transformed equations we see that the properties of a specific boundary layer can be determined by a so-called "principal function" which appears as a parametric functional coefficient in the new equations. It can be proved that the velocity profile and other properties, such as the shear stress factor at a specific section of the boundary layer, are determined by the local value of the principal function in addition to the new longitudinal coordinate. On this basis, a simple method of solution of admissible accuracy is presented, which makes the otherwise tedious calculation of shear stress a very simple task.

AUTHOR: ZHOU Nan [0719 0589]

ORG: None

TITLE: "Two-dimensional Turbulent Jet Theory in a Stratified Fluid Due to Temperature Difference"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 353-363

TEXT OF ENGLISH ABSTRACT: This paper studies the characteristics of two-dimensionav turbulent jet in a stratified fluid due to temperature difference in semi-infinite space. To account for the effect of buoyancy on the jet, a new hypothesis of the Reynolds stresses $-\overline{u_1'v_1'}$, $-\overline{\rho'v_1'}$ is made. For small Richardson number, we obtain the exact solution of equations of first order accuracy. This solution is different from the existing ones. The results are compared with experimental ones, and good agreement has been found. Results of this paper are useful for small Richardson numbers.

AUTHOR: QIAN Weizang [6929 0251 7022]
DAI Fulong [2071 4395 7127]

ORG: Both of Qinghua University

TITLE: "Effective Elastic Constants for Thick Perforated Plates"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 364-371

TEXT OF ENGLISH ABSTRACT: In this paper the constraint conditions of thick perforated plate ligament and corresponding bimoment in the ligament section are described. From these considerations theoretical formulae for calculating effective elastic constants of thick perforated plates with triangular penetration pattern are obtained. Theoretical values obtained from these formulae are in good agreement with Sampson's experimental results and Slot's numerical solution.

AUTHOR: GAO Yizhong [7559 5030 0022]

ORG: Shanghai Guangming Tool and Link-chain Factory

TITLE: "Nonlinear Flutter Analysis for Helicopter Rotor Blade"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 372-386

TEXT OF ENGLISH ABSTRACT: With the advent of fiberglas reinforced blade and due to the existence of backlash in rotor control system, it is necessary to study the flutter of a nonlinear structure. This paper tries to present a flutter analysis method for the rotor blade to meet such a need. The method may be of interest to helicopter designers.

AUTHOR: ZHONG Wanxie [6945 8001 0533]
QIU Chunhang [5941 2504 5300]

ORG: Both of Dalian Institute of Technology

TITLE: "Theory of Analysis of Partially Symmetric Structures"*

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 387-398

TEXT OF ENGLISH ABSTRACT: This paper combines the concepts of substructure analysis and group-theoretic methods to treat partially symmetric structures. It points out that if generalized displacements on the base vectors in irreducible subspaces are taken as unknown variables then the original displacement space can be divided into a series of uncoupled displacement subspaces, even for the substructure condensation problems. For each subproblem, triangularization of the internal global matrix as well as the condensation of the external stiffness matrix can be carried out individually. The combination of these condensed external stiffness matrices is just the external stiffness matrix of this substructure to the generalized displacements. The transformation to the external stiffness matrix represented in terms of the original displacements is also described. It is proved that only the elements relating to the displacements in the basic region need be calculated.

[Continuation of LIXUE XUEBAO No 4, 1981 pp 387-398]

This method increases the computation efficiency enormously in comparison with the ordinary repeated substructuring method.

* This paper was reported at the 15th ICTAM, Toronto, Canada, 1980.

AUTHOR: XU Cida [1776 2945 6671]
SHI Defang [2457 1795 5364]

ORG: Both of Tongji University

TITLE: "Discrete Method of Least Squares in Analysis of Plate-bending Problem"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 399-406

TEXT OF ENGLISH ABSTRACT: In this paper, the use of the discrete method of least squares (one of the MWR methods) to compute several plate-bending problems is presented. The trial function is a double power series with polynomial terms of two variables, which initially does not satisfy the governing differential equation of the plate nor the boundary conditions given. Therefore, the method used is a mixed method in MWR. All equations have been made dimensionless and weighted function has been taken as one. The maximum error of calculation for hinged and clamped square plates is less than 1 percent. The computer program is much simpler, time of computation is much shorter and the amount of preparatory work is much less than that of the MFE. It appears that this numerical method possesses many advantages, such as simpler computer program, less time consumption, smaller amount of work and errors in computation are known immediately after computation.

AUTHOR: LAN Zuyun [5695 4371 0061]
ZHANG Renxiang [1728 0086 7534]
ZHANG Hongzi [1728 7703 1217]

ORG: All of Beijing University of Iron and Steel Technology

TITLE: "An Experimental Method to Study Human Joint Motion in Biomechanics"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 407-410

TEXT OF ENGLISH ABSTRACT: This paper introduces an in vivo experimental method and its principles in studying the motion of the human joint. By means of this method, it is possible to investigate the rules of motion of the bio-joint. This is necessary for the establishment of a biomechanical model as well as of bioengineering design. From our experiments, we found that the human knee joint and the human cubit joint are not the usual moving pairs, but are special bio-hinges.

AUTHOR: JIANG Fuben [1203 1788 2609]
LIU Baochen [0491 1405 3819]
LIN Shutian [5677 2579 3944]

ORG: JIANG of the Department of Mechanical Engineering, State University of New York, Stony Brook; LIU and LIN both of the Department of Engineering Mechanics, Qinghua University

TITLE: "Multipurpose Moire Fringes Method Applied to the Strain Analysis around Crack-tip in Slanted Notched Plates"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 411-416

TEXT OF ENGLISH ABSTRACT: In this paper, 500 lines per inch Moire grating is made of the specimen's grating. Using the multipurpose Moire fringes method, multipurpose u and v-field isothetics around crack-tip and crack-opening displacements were experimentally determined in the slanted notched plates. The strain-fields were obtained before and after the crack began to propagate.

AUTHOR: JIAO Luqiong [3542 1462 8825]
WANG Ruquan [3769 3067 2938]

ORG: Both of the Computing Center, Chinese Academy of Sciences

TITLE: "Numerical Calculation of Hypersonic Viscous Flows over Hemisphere Cones at Angles of Attack"

SOURCE: Beijing LIXUE XUEBAO [ACTA MECHANICA SINICA] in Chinese No 4, 1981 pp 417-420

TEXT OF ENGLISH ABSTRACT: A method for calculating hypersonic viscous flow over hemisphere cone is presented in this paper. Calculations are based on equations of three-dimensional shock layer. The difference method and marching technique along a streamwise direction are used. Shock shapes are automatically determined in the solution procedure.

9717
CSO: 4009/452

AUTHOR: NI Yunqi [0242 0336 3825]
JIN Hanliang [6855 3552 5328]
XUE Zongyuan [5641 1350 0337]

ORG: NI and JIN both of the Department of Meteorology, Nanjing University; XUE of Shanghai Typhoon Institute

TITLE: "An Operational Numerical Forecasting Scheme of Typhoon Tracks over the Western Pacific and Its Preliminary Results"

SOURCE: Beijing DAQI KEXUE [SCIENTIA ATMOSPHERICA SINICA] in Chinese Vol 5 No 3, Sep 81 pp 281-291

TEXT OF ENGLISH ABSTRACT: In this paper, an operational numerical forecasting scheme of typhoon tracks over the western Pacific is proposed. In this scheme, the accuracy of computations is raised by applying the inverse smooth operator, and the prediction is improved by introducing the position of typhoon six hours after the initial time with application of the least square method. Sixty-nine historical cases were experimentally forecast and 48 cases in the 1977-1979 typhoon season were forecast routinely by this scheme with certain success. Finally, an approach for further improving this scheme is discussed.

AUTHOR: HUANG Ronghui [7806 2837 6540]
LI Rongfeng [2621 2837 7685]

ORG: Both of the Institute of Atmospheric Physics, Chinese Academy of Sciences

TITLE: "Statistical Features of the Vertical Distribution of Temperature and Wind of the Atmosphere and Their Application to the Design of a Numerical Weather Prediction Model"

SOURCE: Beijing DAQI KEXUE [SCIENTIA ATMOSPHERICA SINICA] in Chinese Vol 5 No 3, Sep 81 pp 300-309

TEXT OF ENGLISH ABSTRACT: In this paper the empirical orthogonal function is used to expand the observed vertical temperature profiles and the observed vertical wind profiles for Beijing, Shanghai and Guangzhou. The results show that the vertical temperature profiles at temperate and high latitude can be described by six parameters, the number of eigenvalues and correcponding eigenvectors, while seven to eight parameters are needed for low altitude. On the other hand, the vertical wind profiles can be represented by nine parameters for the temperate and high latitude as well as low latitude. It is shown from these facts that in order to accurately describe the baroclinic characteristic of the atmosphere, at least six levels are needed. If the initial wind fields are computed from the observed wind data, it is adequate to use nine levels in a primitive equation model.

9717
CSO: 4009/2

AUTHOR: XU Yi [1776 3015]
LIAO Fuzhong [1675 1788 0022]
DAI Runsheng [2071 3387 3932]
et al.

ORG: XU, LIAO and DAI, et al., all of the National Institute of Metrology; et al.

TITLE: "Ring Lasers for Precise Angle Measurement"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 163-168

TEXT OF ENGLISH ABSTRACT: At present, ring lasers have been developed for angular velocity and angle sensors. These are very useful in inertial navigation and precise angle setting. This paper describes the experiment for the precise measurement of an angle with the ring laser. The principle, scheme of the ring laser with four frequencies, measuring results and methods for increasing the measuring accuracy are given. The measuring error of this apparatus is about ±1 radian second (3σ), and it is possible to measure an angle by the ring laser with an accuracy of ±0.5 radian second or less.

AUTHOR: FAN Hongfu [5400 7703 8702]

ORG: Department of Machinery, Xi'an Jiaotong University

TITLE: "An Analysis of Pneumatic Measurement of the Opening of Sliding Spool Valve"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 169-178

TEXT OF ENGLISH ABSTRACT: This paper describes a method of measuring the opening of a sliding spool valve with a low-pressure pneumatic instrument. According to the analysis of this instrument, the paper proves that the measured value of amplification rate i_* of the instrument determines the inflective point S_* of the valve opening, that is to say that it determines the initial point of the characteristic curve of the valve opening and the opening of the valve can be thus determined. The paper argues that this method may reduce the error caused in the classical method in which the characteristic curve is approximated by a straight line. Based on the above-mentioned point of view, the paper points out that the determination of the valve opening of a flow-type pneumatic instrument cannot be corrected as stated above.

AUTHOR: JIANG Heping [5592 0735 1627]
QIAO Shizhong [0829 0013 1813]

ORG: Both of Shanghai Metrology Research Institute

TITLE: "An Attenuation Measuring System with Self-calibration Technique in the Frequency Range of 8.6 - 9.7 GHz"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 179-183

TEXT OF ENGLISH ABSTRACT: This paper describes an attenuation measuring system with self-calibration technique in the frequency range of 8.6 - 9.7 GHz. The uncertainty in the measuring range of 0-42 dB is less than 5×10^{-4}.

AUTHOR: YANG Di
et al.

ORG: None

TITLE: "A Provisional Primary Standard of Microhardness Tester"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 184-187

TEXT OF ENGLISH ABSTRACT: This paper describes a precision microhardness tester which is used as the provisional primary standard. The loading process and the duration of loading are controlled automatically. The magnification of the microscope used for indentation measurement is 640. There are six loading stages which are 50, 100, 200, 300, 500 and 1000 grams. The measuring accuracies are better than ± 2,0 percent at 200 g and ± 3.0 percent at 50 g (below HV500) respectively.

AUTHOR: DAI Leshan [2071 2867 1472]
LING Shankang [5677 0810 1660]

ORG: DAI of Fudan University; LING of the National Institute of Metrology

TITLE: "A New Deviation Function for Standard Resistance Thermometer"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 188-197

TEXT OF ENGLISH ABSTRACT: This paper proposes a new unified deviation function for 13.81 - 273.15K, which is:

$$\Delta W = W - W_s = (W-1)\frac{a_4 + a_5 W + a_6 W^2 + a_7 W^3}{1 + a_1 W + a_2 W^2 + a_3 W^3}$$

Results show that non-uniqueness of the new scale proposed is much better than IPTS-68, especially in the region of 17-273.15K.

AUTHOR: CHU Zaixiang [5969 6528 4382]
CHEN Shouren [7115 1343 0088]
CHEN Hongpan [7115 1347 4323]

ORG: All of Harbin Institute of Technology

TITLE: "The Calculation of Effective Emissivities of Axisymmetric Isothermal Diffuse Cavities"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 198-207

TEXT OF ENGLISH ABSTRACT: In this paper, a method used to calculate the effective emissivities, the most important parameter of the axisymmetric isothermal diffuse blackbody cavities, is described. This method is simpler because of its neglecting the third reflection of radiation, so that the numerical iteration can be avoided.

Using the numerical zone-approximation method, we have calculated the emissivities of some typical double cones, cylindrocones, conical and cylindrical cavities on a TQ-16 digital computer. After comparing our results with those obtained by the precise method, we found that very high accuracy can also be attained with our method. Especially in the cases of higher material surface emittance ε, for instance $\varepsilon = 0.85$, the maximum deviations along the whole surface of every equal practical cavity between the two methods are all less than 0.0002.

AUTHOR: HU Qiduo

ORG: None

TITLE: "A Multi-purpose Boot-strap Operational Amplifier"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 208-216

TEXT OF ENGLISH ABSTRACT: This paper describes a multi-purpose amplifier based on the so-called boot-strap method. It can be used as the ideal phase opposition shifter, the follower with good isolation, the differentiator and the automatic regulator for balancing the auxiliary branch of the bridge, etc.

A common basic circuit can be used for all these purposes, with only a few parameters and the feedback types having to be changed correspondingly. The frequency range is from 0 to 2500 Hz, and the operating error is a few parts in 10^6.

AUTHOR: HU Yanrui [5170 5888 3843]
MU Shaolin [4476 4801 2651]

ORG: HU of the National Institute of Metrology; MU of Yangzhou Teacher's College

TITLE: "The Stability of Highly Precise Saturated Standard Cells"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 217-221

TEXT OF ENGLISH ABSTRACT: This paper describes the research on the variation of the unit value of the highly precise saturated standard cells which are used as the secondary standard of voltage. The results show that the annual change of EMF of these cells developed by our laboratory is less than 0.3 μV. At the same time, the effect of the glass container, clearing method of H-vessel of glass, electrolyte acidity and particle size of Hg_2SO_4 on the stability of highly precise saturated standard cells are also discussed.

AUTHOR: WU Xuezhou [0702 1331 0719]
J.B. Adam
R. Vatin

ORG: WU of the National Institute of Metrology; Adam and Vatin both of the Laboratoire de Metrologie des Rayonnement Ionisant

TITLE: "Absolute Measurement of the Activity of ^{14}C Nuclide with Liquid Scintillation Coincidence"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 222-227

TEXT OF ENGLISH ABSTRACT: This paper describes the liquid scintillation coincidence for standardization of pure β emitter. The efficiency of a liquid scintillation detector may be varied by placing optical filters between the vessel and the phototube. The count rate of three channels varies with the anode current. The value N_1N_4/N_c calculated with the Cox-Isham formula varies monotonously with the anode current, but the disintegration rate can be obtained with the extrapolation of N_1N_2/N_c as the inverse anode current is approaching zero.

AUTHOR: XIE Shengluo [6200 5116 3157]
WANG Xuan [3769 5503]
XU Baojin [1776 5508 3866]

ORG: All of the National Institute of Metrology

TITLE: "pH Scale of Aqueous Solution at Elevated Temperature 100-150°C"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 228-232

TEXT OF ENGLISH ABSTRACT: This paper describes the establishment of pH scale of aqueous solution at elevated temperature 100 to 150°C. In this work, the method of hydrogen electrode-silver/silver chloride electrode without liquid junction cell has been used for determining the pH of four standard solutions which contain pH ranging from 1 to 9. The total uncertainty is ± 0.04 pH. The comparison between our results and others is also given.

AUTHOR: TANG Gaohua
et al.

ORG: None

TITLE: "The Precise Coulometric Titration Method for the Determination of the Purity of Sodium Chloride"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 233-238

TEXT OF ENGLISH ABSTRACT: This paper describes a method for the determination of the chloride ion with coulometrically generated silver ion, in which the silver plate (stated purity 99.999 percent) is used as a generator anode, the platinum net used as a cathode, the Ag_2S ion-selective electrode for the indicator electrode and the reference electrode is Type 217 calomel electrode for two salt bridges.

Sodium chloride was solid weighed before adding the sample and it was resolved with a small amount of distilled water. During electrolysis, the solution was stepwise dropped from a pipet to the electrolyte; therefore, on the one hand the diffusion of silver ion to cathodic electrolyte can be eliminated, and on the other hand the error caused by the precipitate of silver chloride to inclusion of the sodium chloride can be avoided because of the addition of the solid samples. When the four groups of 0.2, 0.3, 0.4 and 0.5 grams are weighed, the mean values of their purities are 100.002, 99.998, 99.999 and 100.000 percent respectively, which shows

[Continuation of JILIANG XUEBAO No 3, 1981 pp 233-238]

that the purity values of determination are in good agreement.

The sources of random and systematic errors are analyzed also. The standard deviation of this method is 0.005 percent, and when the confidence level is about 99 percent the total uncertainty is 0.006 percent for the measurement of sodium chloride.

AUTHOR: XIE Xingyao [6200 5281 1031]

ORG: National Institute of Metrology

TITLE: "A Reduced Formula for Calculating Distribution Temperature of Tungsten Incandescent Lamps"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 3, 1981 pp 239-241

TEXT OF ENGLISH ABSTRACT: In this paper, a reduced formula for calculating temperature distribution of tungsten lamps is derived from the CIF definition formula of temperature distribution of light sources directly by means of the spectral characteristics of tungsten incandescent lamps in visible regions.

9717
CSO: 4009/465

AUTHOR: LU Yupo [7120 5940 2613]
MA Ping [7456 1627]
ZHANG Jingyun [1728 2529 0061]
WANG Xilian [3769 6932 6647]
LI Qixun [2621 0366 6064]

ORG: LU, MA, ZHANG of Military University of Medicine No 4, Hospital No 1; WANG, LI of Kunming Troop Hospital

TITLE: "Management of Missile Injuries of the Spine and Spinal Cord"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 4, Aug 81 pp 196-198

ABSTRACT: Missile injuries of the spine and spinal cord often involve organs of the chest and abdomen beyond the spinal wounds that are difficult to heal and severe infection may also complicate the situation. The mortality rate of such wounds during WWI and II was as high as 47-80 percent, before antibiotics were introduced. Today, with antibiotics and such measures as blood transfusion to combat shock, etc. much progress has been made and the mortality rate has been reduced to below 15 percent. This paper reports the satisfactory results of treating 20 cases of such injuries, with emphasis on post-operative care and management. Clinical data and treatment results are given. Cases suitable and not suitable for surgery are discussed in special detail.

AUTHOR: ZHOU Leming [0719 2867 2494]
WU Guanghua [0702 0342 5478]
DING Shichang [0002 0013 2490]
LI Faqing [2621 3127 0615]
MENG Qingsi [1322 1987 3123]
CHEN Faxiang [7115 4099 4382]
QIANG Wanhong [6929 8001 4767]

ORG: All of Nanjing Troop Military Medicine Research Institute

TITLE: "Preliminary Study on Routes of Transmission of Epidemic Hemorrhagic Fever Infection"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 4, Aug 81 pp 206-207

ABSTRACT: In Apr-Aug 80, the authors used Apodemus agrarius as the experimental animal to carry out a preliminary study on the pathways of transmission of epidemic hemorrhagic fever in the 4 groups of skin wounds, mite vectors, the respiratory tract, and the gastroenteric tract. Results confirm with those of ordinary epidemiological surveys in so far as the fact that hemorrhagic fever related antigen positive blood and urine of the experimental animal are infectious and the infection is transmitable through skin wounds and bites of mites. With the density of these rats at its peak during the fall harvest season, there must be an increase of contamination of their excrement in crops and soil. This fact is perhaps related to the fact that the peak of hemorrhagic fever occurs in the fall and winter. Study of transmission through respiratory and gastrointestinal tracts is being continued.

AUTHOR: TIAN Niu [3944 3662]
YE Genyao [0673 2704 5069]
LIU Yong [0491 3057]

ORG: None

TITLE: "Treatment of 4 Cases of Acute Radiation Disease and Follow-up 18 Years Later"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese Vol 6 No 4, Aug 81 pp 216-219

ABSTRACT: On 11 Jan 63, the 10 Ci [curie] ^{60}Co source, used for irradiating seeds, was brought home by a little boy. Consequently, the boy, his mother, brothers, sister, and an uncle who stayed over night, received 9 hours of irradiation, and acute radiation sickness developed, with symptoms of general weakness, lack of appetite, and nausea for all and vomit and abdominal pain for some. A fever developed with positive bacterial culture of the blood 8 days later. When the temperature was receding, the white blood cell count rose, but with treatment and care, the acute stage was over in 2 months for 4 of the group. The boy and his brother died 12 and 11 days after the accident respectively. Due to the unevenness of the exposure, the uncle's left ankle was severely burned and amputation was performed in 1968. The mother suffered fracture of the hip following ulceration of the leg for years but was healed in 1975. The paper includes brief analyses of the thyroid glands, the adrenocortical, sexual, and immune functions, and changes of the blood building system, the EEG, cell chromosomal anomalies, etc. of the 4 survivals during the past 18 years.

6248
CSO: 4009/495

Oceanology

AUTHOR: LI Jing [2621 7234]
ZHANG Minxiu [1728 2404 4423]
XU Chao [1776 3390]
et al.

ORG: All of the Department of Marine Chemistry

TITLE: "Marine Environmental Geochemistry. III. Forms of Arsenic in Surface Sea Water of Jiaozhou Bay"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 11 No 3, 1981 pp 32-38

EXCERPTS FROM ENGLISH ABSTRACT: 1. The content of the total arsenic, particulate arsenic, dissolved arsenic, dissolved organic arsenic and inorganic arsenic (As (III) and As (V)) in the surface sea water taken from coastal sites of Jiaozhou Bay have been determined by using anodic stripping voltametry (ASV) and Fe $(OH)_3$ coprecipitation-DDCAg methods.
2. The results of the experiments show that: (1) The forms of arsenic in the coastal surface water of Jiaozhou Bay are essentially particulate arsenic; (2) The concentration range of dissolved arsenic is equivalent to the content of arsenic in unpolluted sea water, which means that the water of Jiaozhou Bay has not been polluted yet by arsenic; (3) The sites from which water samples contain organic arsenic in concentrations of more than 50 percent of the total dissolved arsenic

[Continuation of SHANDONG HAIYANG XUEYUAN XUEBAO Vol 11 No 3, 1981 pp 32-38]

are situated in estuaries, downstream from pesticide factories and near agricultural areas; (4) The fluctuation of concentrations of inorganic arsenic in Jiaozhou Bay is very small, but the ratio of As(III)/As(V) is quite different (from 0.56 to 3.16). Sites with a high As(III)/As(V) ratio are situated in areas along the coast. Whether there is any relationship between the As(III)/As(V) ratio and high primary productivity or bioreduction should be identified later by field investigations.

AUTHOR: CAO Qinchen [2580 2953 5256]
LIU Changshi [0491 2490 1395]
MOU Weixi [3664 1919 3588]

ORG: CAO of Shandong College of Oceanology; LIU and MOU both of Nanjing University

TITLE: "A Preliminary Study of Volcanic Rocks and Various Intrusive Rocks in Hongdao District, Qingdao"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 11 No 3, 1981 pp 71-101

TEXT OF ENGLISH ABSTRACT: In this article the volcanic mechanism of Hongdao District, Qingdao, is discussed. Petrographic-chemical analysis was made for 60 samples collected from volcanic rocks and various intrusive rocks of the Qingshan Group. Through the calculations using the methods of CIPW, Rittmann, etc., diagrams of the methods of MacDonald, Rittmann, etc., and comparison with the average value of Nockoldo trachyte-andesite and the volcanic rocks of the lower part of the Changjiang River, these samples are considered to be of alkaline rock series and evolve toward enrichment of potassium.

According to Q-grouping method of mathematical geology, these samples can be divided into two types: one is basic-neutral rock of the first cycle of the

[Continuation of SHANDONG HAIYANG XUEYUAN XUEBAO Vol 11 No 3, 1981 pp 71-101]

Qingshan Group and the other is acidic rock of the second cycle.

In addition, the genesis of volcanic rocks and intrusive complexes are discussed according to corresponding methods of mathematical geology, especially the diagram of Raju's method. There are two different origins of Laoshan granite, Qingdao, to be considered: the pink granite characterized by biotite is magmatic in origin and the pale granite without biotite is of replacement origin.

9717
CSO: 4009/19

AUTHOR: CHEN Heli [7115 5440 4539]
TANG Xiyuan [3282 6932 0337]

ORG: Both of the Geology Department, Northwest University

TITLE: "A Study of Clay Compaction and Primary Migration of Oil and Gas"

SOURCE: Jiangling SHIYOU YU TIANRANQI DIZHI [OIL AND GAS GEOLOGY] in Chinese Vol 2 No 2, Jun 81 pp 114-122

TEXT OF ENGLISH ABSTRACT: A study concerning clay compaction, based on the data of time-depth relationships of acoustic wave transmission from nearly 50 walls in the Biying depression, proves that: 1) There is usually a great difference in clay compaction in different parts of the same depression, and the oil and gas accumulation is closely associated only with the areas where both hydrocarbon generation and primary migration occur; 2) The anomalous compaction section of the clay after organic matter maturation may determine the possible depth of primary migration in this area; 3) The rapidly compacted zones of the anomalous compaction section seem to be the most favorable intervals for the primary migration of hydrocarbons; 4) The depth, favorable to primary migration, determines the main stage of oil and gas accumulation; 5) The highly compacted clay section may form a caprock which is sealed by pressure and affects the depth of longitudinal distribution of oil and gas accumulation.

AUTHOR: ZHANG Fumin [1728 2591 3046]
JIAN Zongyu [4675 1350 3254]

ORG: Both of the Geology Research Institute, Dagang Oil Field

TITLE: "The Sedimentation History and Environmental Characteristics of the Early Tertiary in Huanghua Basin"

SOURCE: Jiangling SHIYOU YU TIANRANQI DIZHI [OIL AND GAS GEOLOGY] in Chinese Vol 2 No 2, Jun 81 pp 141-157

TEXT OF ENGLISH ABSTRACT: Huanghua Basin is one of the Mesozoic and Cenozoic fault-limited basins and is also one of the important oil-bearing basins in eastern China. The Early Tertiary sediments in it have a huge thickness of about 6000 meters, resulting from two large sedimental cycles of Eocene and Oilgocene ages. It can be divided into three stages of development: 1) The earlier, nonuniform depression; 2) Middle, deep depression accompanied by extension; 3) The later, uplift and contraction. There are different characteristics of sedimentation types for each of these stages: 1) The earlier stage is characterized by sedimentation predominantly in saline lake and alluvial fan environments; 2) The middle stage has mainly subaqueous sedimentation from gravitational flow; 3) The later stage is characterized by extensive development of the river delta. Oil and/or gas is formed and concentrated at all three of the above-mentioned stages, with the richest occurring at the middle stage. This article deals with the sedimentation process in the Huanghua Basin and its major sedimental types during the Eocene-Oligocene.

AUTHOR: YANG Wenkuan [2799 2429 1401]

ORG: Fifth Headquarters of Petroleum Prospecting and Exploration, Ministry of Geology

TITLE: "A Discussion of the Method for Quantitative Prediction of Oil and Gas"

SOURCE: Jiangling SHIYOU YU TIANRANQI DIZHI [OIL AND GAS GEOLOGY] in Chinese Vol 2 No 2, Jun 81 pp 104-113

TEXT OF ENGLISH ABSTRACT: As the major component of kerogen, carbon, according to its distribution during revolution, can be divided into potential carbon (B_0), which transforms gradually into the molecules of bitumen, and nonpotential carbon (N), which cannot undergo such a change. With the increasing of the buried time and depth, the residual rate of carbon decreased gradually. In addition, the so-called potential carbon may be subdivided into transformed carbon (including the released carbon M from source rock, residual oil and gas and chloroform-extracted bitumen A of source rock) and the not yet transformed carbon (B). $B/B_0 = \alpha$, which is called the residual carbonic rate of potential carbon in kerogen. A further study of α may obtain rather accurate information during the kerogen revolution.

According to the kerogen thermo-degradation of oil and gas genetic theory and the basic principle of chemical kinetics, the author has deduced the residual carbonic rate of potential carbon and other mathematical formulas.

[Continuation of SHIYOU YU TIANRANQI DIZHI Vol 2 No 2, Jun 81 pp 104-113]

Applying these formulas and the data for the abundance of total organic carbon and disseminated bitumen, it is possible to solve some questions related to quantitative oil and gas prediction, such as the quantitative estimation of maturity of kerogen, the reconstruction of the evolutionary process of kerogen, the confinement of the upper and lower limits for mature zones, the estimation of the amounts of bitumen generated, the calculation of the primary amounts of oil and gas, and the comprehensive assessment of the source rocks.

This method can be applied to various sedimentary rocks, including coal-bearing strata and "red beds."

9717
CSO: 4009/30

AUTHOR: ZHANG Zhitian [1728 1807 1131]
SUN Wenke [1327 2429 4430]

ORG: Both of the Seismological Bureau of Jiangsu Province

TITLE: "The Anomalous Magnetic Declinations before the Liyang Earthquake (M=6.0)"

SOURCE: Kunming DIZHEN YANJIU [JOURNAL OF SEISMOLOGICAL RESEARCH] in Chinese Vol 4 No 2, 1981 pp 152-157

TEXT OF ENGLISH ABSTRACT: According to the results from the review of magnetic declinations at nearly 200 sites after the Liyang Earthquake (M=6.0), this paper suggests the determinative method and selective standard for the quality of the magnetic declination data and points out that the majority of the sites (over 98 percent) are strongly interfered with by the environmental and instrumental conditions. By analyzing the anomalous magnetic declinations before the Liyang Earthquake it is considered that the discernible anomalies are shown only within 100 km from the epicenter and the anomalous period is less than 2 months. The paper suggests that there should be an overall rearrangement and improvement for the observation of the magnetic declination. If the data quality can be guaranteed, it can be expected that magnetic declination will play a certain role in short-term prediction.

AUTHOR: LI Mengluan [2621 1322 7019]
ZHAO Zhijun [6392 4249 6511]

ORG: Both of the Seismological Bureau of Ningxia Province

TITLE: "The Time Characteristics of the Precursory Swarms and Short-term Precursory Anomalies"

SOURCE: Kunming DIZHEN YANJIU [JOURNAL OF SEISMOLOGICAL RESEARCH] in Chinese Vol 4 No 2, 1981 pp 158-165

TEXT OF ENGLISH ABSTRACT: According to the Chinese earthquake data of the past few years, it was found that a number of strong earthquakes were preceded by swarm activities. Some of these swarms occurred at the epicentral area or its vicinity of the forthcoming shocks, or at an active tectonic zone which had conjugate relationships with the earthquake-generating tectonics of the main shock and kept a certain distance away from the epicenter of the forthcoming earthquake. Such swarms began to appear five months before the main shock in most cases, and we call them precursory swarms. The maximum magnitude M_b among the precursory swarms, the duration T of the swarms and the epicentral distance D away from the main shock have nothing to do with the magnitude M_{main} of the forthcoming main shock. If the observational precursory data are also taken into account for the analysis, it seems to be reasonable to set the five months before the shock as the upper limit for the appearance of the short-term precursors of the strong earthquakes. During

[Continuation of DIZHEN YANJIU Vol 4 No 2, 1981 pp 158-165]

this time interval, the observed curves of the precursors either adopt turns or show apparent phenomena of acceleration, i.e., switching from a stage of medium-long-term slow changes into those of short-term accelerated changes. In addition, when the epicenters of strong earthquakes migrated along the active tectonic zone or the edge of a block, a five-month separation for the migration was also observed.

AUTHOR: CHU Zhihong [5969 1807 1347]
SONG Huting [1345 1487 1656]

ORG: CHU of the Seismological Bureau of Jiangsu Province; SONG of Nanjing University

TITLE: "A Preliminary Discussion of Solar Activity Correlated with Earthquakes Occurring in China"

SOURCE: Kunming DIZHEN YANJIU [JOURNAL OF SEISMOLOGICAL RESEARCH] in Chinese Vol 4 No 2, 1981 pp 185-195

TEXT OF ENGLISH ABSTRACT: Results from Chinese seismological statistical examinations have disclosed the 1st-20th periods of solar activity in the following:
1. The magnitude of deep-focus earthquakes ⩾5 (not including aftershocks) is closely correlated with the lgR linearly.
2. In the 2nd, 3rd or 4th year following the maximum value year of the 11-year-period of solar activity, in particular the 3rd year, the activities of earthquakes ⩾6 with shallow or medium-deep foci clearly tended to increase. Activities of shallow or medium-deep foci earthquakes ⩾7 tended to increase in the 3rd year following the maximum value year. In the continental areas, shallow or medium-deep foci earthquakes ⩾6 also tended to have clear-cut increased activities in those three years. In Taiwan, earthquakes with magnitudes ⩾6 or 7 were most active in the year M + 3.

[Continuation of DIZHEN YANJIU Vol 4 No 2, 1981 pp 185-195]

A preliminary discussion of the physical process of solar activity affecting the occurrence of earthquakes occurring in China is also made in this paper.

9717
CSO: 4009/4

AUTHOR: LI Yuan [2621 3220]

ORG: None

TITLE: "Reciprocal Mixing in HF Communication Receivers in the Fixed Service"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 5, 81 pp 23-25

ABSTRACT: Frequency synthesizers have now been generally adopted in modern good quality receivers but the frequency provided by the available frequency synthesizers is insufficiently pure. Aside from the needed signals, many other frequencies are usually mixed in and the required output signals usually carry noises on both sides to affect the interference and noise resistance property of the receiver. Thus, a new demand has appeared in recent years; this is the so called reciprocal mixing. There is no internationally unified index for measuring reciprocal mixing, however. The indices adopted by the various countries are also by no means uniform. Aside from discussing reciprocal mixing of receivers with frequency synthesizers, this paper proposes a quantitative relationship between the external noise carried by a frequency synthesizer and the reciprocal mixing standard of the receiver and suggests a unified testing method as the standard. Finally, some typical data of reciprocal mixing are introduced. It is hoped that they may be included in related document of the CCIR. This paper was submitted to the 1980 CCIR meeting.

6248
CSO: 4009/498

AUTHOR: RUAN Changgeng [7086 7022 5105]
CHEN Chongkun [7115 6850 0981]
CHEN Yueshu [7115 5141 2579]
YU Li [0060 0500]
TU Guangchou [3205 0342 0321]
XU Jinju [6079 6855 5468]
et al.

ORG: RUAN, CHEN Chongkun and CHEN Yueshu all of the Department of Blood Diseases, Suzhou Medical College; YU, TU and XU, et al., all of the Kunming Institute of Zoology, Chinese Academy of Sciences

TITLE: "The Action of the Fibrinolytic Enzyme of the Venom of *Agkistrodon halys* (Pallas) on Fibrinogen"

SOURCE: Kunming DONGWUXUE YANJIU [ZOOLOGICAL RESEARCH] in Chinese No 2, May 81 pp 163-167

TEXT OF ENGLISH ABSTRACT: By means of SDS (sodium dodecyl sulfate)-polyacrylamide gel electrophoresis, it was demonstrated that the fibrinolytic enzyme of *Agkistrodon halys* (Pallas) venom not only degrades the α chain but also degrades the β chain of human fibrinogen. A series of fragments with different molecular weights, X', Y', D' and E', could be observed electrophoretically on acid polyacrylamide gels after degrading fibrinogen. The mechanism of the hydrolytic action of human fibrinogen by the fibrinolytic enzyme is discussed.

9717
CSO: 4009/488

END

JPRS 79271

22 October 1981

China Report

SCIENCE AND TECHNOLOGY

No. 132

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79271

22 October 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 132

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

PUBLICATIONS

Table of Contents of 'LIXUE YU SHIJIAN' Vol 3 No 3, 1981 1

Table of Contents of 'BIAOZHUNHUA TONGXUN' No 4, 1981 4

Table of Contents of 'GAOFENZI TONGXUN' No 4, 1981 5

Table of Contents of 'QICHE JISHU' No 8, 1981 7

ABSTRACTS

BUILDING CONSTRUCTION

JIANZHU /BUILDING CONSTRUCTION/, No 8, 30 Aug 81 9

ELECTRICAL MACHINERY

DADIANJI JISHU /LARGE ELECTRICAL MACHINERY/, No 4, 1981 10

ELECTRONICS

DIANZI JISHU /ELECTRONIC TECHNOLOGY/, No 8, 20 Aug 81 11

WUXIANDIAN /RADIO/, No 9, 11 Sep 81 12

ENERGY CONSERVATION

XIN NENG YUAN /NEW ENERGY SOURCES/, No 4, 5 Aug 81 14

GEOLOGY

DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA No 3, 1981 16

HYDROELECTRICITY

SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER], No 8, 20 Aug 81 27

HYDROLOGY

SHUIWEN [HYDROLOGY], No 4, 25 Aug 81 28

MARINE ENGINEERING

JIANCHUAN ZHISHI [NAVAL AND MERCHANT SHIPS], No 8, Aug 81 31

METEOROLOGY

QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA], No 3, Aug 81 32

NONMETALLIC ORES

FEIJINSHU KUANG [NONMETALLIC ORES], No 3, 28 Aug 81 35

OIL PROSPECTING

SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING], No 4, 15 Aug 81 37

SEMICONDUCTORS

BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS], No 3, 1981.... 39

TRANSPORTATION CONSTRUCTION

DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE], No 8, 1981 44

UNDERGROUND ENGINEERING

DIXIA GONGCHENG [UNDERGROUND ENGINEERING], No 8, 11 Aug 81 46

VACUUM TECHNOLOGY

ZHENKONG [VACUUM], No 4, 25 Aug 81 47

PUBLICATIONS

TABLE OF CONTENTS OF 'LIXUE YU SHIJIAN' VOL 3 NO 3, 1981

Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese Vol 3 No 3, 1981 inside back cover

Survey of the Simulation for Micro-fracture Processes and Its Mechanical Analyses......Cao Weidi [2580 4850 3321], Qinghua University; Wang Ziqiang [3769 5261 1730], Institute of Mechanics, Chinese Academy of Sciences (1)

Principles and Applications of Electric Gas Dynamics...... Liu Weizhong [0491 4850 2398], University of Michigan (7)

Recent Developments and Forecasts in the Mechanics of Flow of Fluids through Porous Media......Guo Shangping [6753 1424 1627], Liu Ciqun [0491 1964 5028], Yan Qinglai [7051 1987 0171] and Huang Yanzhang [7806 1693 4545], all of the Lanzhou Porous Flow Fluid Mechanics Research Group, Chinese Academy of Sciences (11)

New Progress in the (Engineering) Theory of Rock Strength in the Last 10 Years......Lin Tianjian [2651 1131 0256], Scientific Research Institute, Zhujiang Water Conservancy Committee; Zhang Jinzhu [1728 6855 6999], 330 Design Academy (17)

A Survey of Plastic Constitutive Relations in Rational Mechanics......Miao Tiande, et al. (24)

Correlation Function Theory of Dense Fluid in Equilibrium ......Sun Zhiwei [1327 4363 0251], Institute of Mechanics, Chinese Academy of Sciences (30)

30 Years of Fluid Dynamics......R.J. Emrich, et al. (35)

Applied Research

Time Average Laser Specklegram of Plate Vibration Using Multiaperture Recording......Jiang Fuben [1203 1788 2609], New York University; Jin Guanchang [6855 6034 2490] and

Zhang Weibao [4545 0251 1405], both of Qinghua University (39)

Determination of the Distances between an Exploder and Gauges for Underwater Explosions......Yan Zhongli [0917 1813 4409], Zhao Chengjun [6392 6134 6874] and Zhang Jincheng [1728 6855 1004], all of the Institute of Mechanics, Chinese Academy of Sciences (41)

Measurements of the Local Heat Flux Density and the Local Saturated Ion-current Density in Plasma Jet......Chen Xi [7115 3356] and Zhou Mingde [0719 2494 1795], both of Qinghua University (45)

Convection-diffusion Heat Conduction Problem in Water-bearing Formation......Liu Ciqun [0491 1964 5028], Lanzhou Porous Flow Fluid Mechanics Research Group, Chinese Academy of Sciences (47)

Logic and Circuit in Velocity Measurement by Laser Dual Foci Technique......Wang Yongguang [3769 3057 0342] and Tan Hong [6151 3163], both of the Institute of Mechanics, Chinese Academy of Sciences; Chu Kehong [5969 0344 1736], Institute of Physics, Chinese Academy of Sciences (49)

Theoretical Proof of the Fracture Form of Specimen under Compression for Brittle Materials......Cheng Yuansheng [4453 3104 3932], Shanghai Institute of Technology (53)

The Membrane-replacing Method for Calculating the Natural Frequencies of Simply Supported Thin Plates......Wang Linsheng [3769 2651 3932], Huadong Water Conservancy College (55)

Equivalent Bending Moment Method for the Calculation of Beam (or Shaft) Deflections......Yin Yuqi [2651 3022 6936], Xi'an Jiaotong University (58)

Brief News on Programming...... (61)

Academic Discussion

On Principle of Virtual Work...... (63)

News and Trends

Research of Methods for Determining the Shear Modulus G_{12} of Fiber-reinforced Composite Materials (Zhang Fuyue [1728 4395 1878], Harbin Engineering Mechanics Institute); On the Method of Photoelastic Gauge (Tu Kuangshi, et al.); Model WZF-90 Reflection Polariscope (Zhang Lin [1728 2651], Beijing Scientific Instruments Plant); Laboratory Modelling of the

Inshore Currents (Liu Yinian); Model WZB_1-4 Quartz Compensator (Cai Zuji [5591 4371 1015], Beijing Scientific Instruments Plant; The New Manufacturing Technology of E-51 (618#) Epoxy Resin Mechanics of Swimming Fish (Li Yuanheng); Death Due to Microwaves? (Li Yuanheng); Measurement of Particle Size (Fu Yushou); Tapping Sun-warmed Ocean Water for Power (Wang Keren); Air Current Gauge (Fu Yushou)...... (66)

The Field of Mechanics

Robert Hooke...... (70)

Inherit and Develop Good Methods of Structural Analysis in China......Wang Lei [3769 4320] and Li Jiabao [2621 1367 1405], both of Hunan University (74)

Bulletins

A Review of Measurement Techniques in Field Explosions...... (77)

The National Conference of Photoelastic Materials...... (77)

Brief Introduction to Conference of Experimental Fluid Mechanics...... (78)

Scope of Knowledge

A Brief Note on the Stress Distribution in a Rectangular Section Bar under Torque...... (79)

New Books...... (79)

Reader, Author, Editor...... (80)

9717
CSO: 4008/1

PUBLICATIONS

TABLE OF CONTENTS OF 'BIAOZHUNHUA TONGXUN' NO 4, 1981

Beijing BIAOZHUNHUA TONGXUN [STANDARDIZATION JOURNAL] in Chinese No 4, 1981 p 1

[Text] Contents [partial]

Report by Yue Zhijian [1471 1807 1017], President of CAS, on the 1981 Academic Annual Meeting of CAS (Abstract)...... (2)

Strengthen the Research on the Effect of Standardization and Promote the Development of Standardization Cause--Speech by Wu Bowen [0702 0130 2429], Deputy Director-General of SBS, on the Symposium on the Economic Effect of Standardization...... (6)

Make a Good Job of Enterprise Standards and Energy Conservation......Ye Zisong, et al. (9)

Principles for Preparation of Standard Terminology...... Cheng Suzhi [4453 5126 0037], Metallography Teaching and Research Group, Beijing Iron and Steel College (11)

Development of Electric Standards and Arrangement of Preferred Coefficient......Yu Qingzhen [0060 1987 4394], Tianjin Electric Drive Design Institute, First Ministry of Machine Building (14)

The Character Object and Methodology of In-plant Standards ......Zhang Qien (23)

Pay Attention to Standards for Environmental Protection in Chemical Fertilizer Industry......Hu Zhesheng (31)

Information on ISO/TC46 Nanjing Meeting......Jiang Shusen (33)

9717
CSO: 4008/466

TABLE OF CONTENTS OF 'GAOFENZI TONGXUN' NO 4, 1981

Beijing GAOFENZI TONGXUN [POLYMER COMMUNICATIONS] in Chinese No 4, 1981 inside back cover

[Text] Papers

The Study of Formation of Grains in Suspension Polymerization of Vinyl Chloride......Zhao Jingsong [6392 0513 2646], Institute of Chemical Industry, Jinxi Chemical Works (246)

Dielectric Study of the Isothermal Crystallization of Amorphous Poly (Ethylene Terephthalate)......Liu Shuquan [0491 2885 0356], Wang Shirong [3769 0013 2827] and Liu Shangqi [0491 1424 3825], all of the Institute of Chemistry, Chinese Academy of Sciences (251)

Study of the Elastic Recovery of Polyester-Polyether Elastomeric Fiber at Lower Temperatures......Chen Chuanfu [7115 0278 4395], Liu Fan [0491 0416] and Wu Meiyan [0702 5019 8827], all of the Institute of Chemistry, Chinese Academy of Sciences (256)

Emulsion Polymerization of Octamethylcyclotetrasiloxane in the Presence of a Cationic Emulsifier......Liu Shufen [0491 3219 5358] and Li Ping [2621 1627], both of the Institute of Chemistry, Chinese Academy of Sciences (262)

Study of the Assignment on the ^{13}C-NMR Spectra of Atactic Polypropylene Stereoisomers......Zhu Shannong [2612 0810 6593] and Yang Xiaozhen [2799 1420 7201], both of the Institute of Chemistry, Chinese Academy of Sciences (267)

Studies on the Nonequilibrium Polymerization of Hexamethyl Cyclotrisiloxane......Zhang Xinghua [1728 5281 5478], Bei Jianzhong [6296 1696 0022], Liu Xiangluan [0491 7449 7762] and Yang Yajun [2799 0068 0689], all of the Institute of Chemistry, Chinese Academy of Sciences (274)

250 MHz High Resolution ^{1}H-NMR Study of the Styrene-4-Methacryloyloxy-2.2.6.6-Tetramethylpiperidine Copolymers...... Hu Chang [5170 2490], Feng Hanbao [7458 3352 0202] and Jiang Dazhi [5592 1129 2535], all of the Institute of Chemistry, Chinese Academy of Sciences (282)

On the Study of the Novel Vulcanization System for Preparation of Silicone Elastomers. I. Crosslinking by Diels-Alder Reaction......Du Zuodong [2629 0155 2767], Liu Hongyun [0491 3163 0061] and Ren Shumei [0117 2885 2734], et al., all of the Department of Chemistry, Shandong University (288)

Intrinsic Viscosity-Molecular Weight Relationship for Poly[4-(4'-Octamethyltetrasiloxanyl) Diphynylether]...... Zhang Lina [1728 0196 1226] and Zhou Guangying [0719 0342 2019], both of the Department of Chemistry, Wuhan University (295)

The Molecular Motions of Copolymers of Tetrafluoroethylene and Perfluoro-4-Methyl-3,6-Oxa-Δ^7-Octyl-Sulfonyl Fluoride...... Wen Jianxun [5113 1696 0534], Lu Meili [7627 3780 7787] and Li Jintang [2621 6930 1016], all of the Shanghai Institute of Organic Chemistry (301)

Notes and Short Communications

Kinetic Studies of Solution Polymerization of Acrylamide with Redox Initiator Systems......Xi Fu [5045 1788], Wang Shenguo [3769 6500 0948] and Li Zhifen [2621 1013 5358], all of the Institute of Chemistry, Chinese Academy of Sciences (306)

The Effect of Segment Compatibility on the Compositional Homogeneity of Polyester-Polyether Multi-block Copolymers ......Wu Meiyan [0702 5019 8827], Zhang Dong [1728 2767], Chen Chuanfu [7115 0278 4395] and Qian Chunqin [6929 2504 3830], all of the Institute of Chemistry, Chinese Academy of Sciences (311)

The Aqueous Polymerization of 2-Hydroxyethyl Methacrylate and the Effect of Sodium Thiocyanate......Qiu Kunyuan [8002 0981 0337], Wang Hongbing [3769 4767 0365] and Feng Xinde [7458 2450 1795], all of the Department of Chemistry, Beijing University (315)

The Activity of Several Stereospecific Catalysts of Lanthanide ......Pang Shufen [6614 2631 5358], Hu Jingyu [2083 2533 0151], Yang Jihua [2799 4949 5478], et al., all of the Changchun Institute of Applied Chemistry, Chinese Academy of Sciences (318)

9717
CSO: 4008/467

PUBLICATIONS

TABLE OF CONTENTS OF 'QICHE JISHU' NO 8, 1981

Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 8, 1981 p 1

[Text] Quality Control

The Index of Processing Capacity and Its Measurement......He Zhaochu (2)

Design and Research

A Study of the Measuring of Valve Timing......Liu Baozhong [0491 0202 0022], Automotive Engineering Department Jilin Institute of Technology (7)

Discussion of Copying in Body Design......Shi Rong [4258 2837], Tangshan Automotive Works (12)

Tests, Measurement and Equipment

Discussion of the Durability Test Code for Automobile Engines ......Chen Yichang [7115 4135 2490], Second Automotive Works Engine Plant (15)

QYZ Model Synchronizer Tester......Hu Liying [5170 4539 5391] and Zhou Xuewen [0719 1331 2429], both of Changchun Automotive Research Institute (20)

Technology and Materials

The Rolling Method and Equipment for Crankshaft Fillets......Li Chunlin [2621 4783 2651], Nanyang Diesel Engine Plant (26)

A N/C Manipulator for High-voltage Electrostatic Painting ......Kan Shiji [7074 0013 4949] and Xie Guangrong [6200 0342 2837], both of Jincheng Automotive Repair Plant, Chengdu (32)

Pitting of the Cam Tappet......Liu Jiajun [0491 1367 3449], Wang Fuxing [3076 1788 5281] and Cui Zhouping [1508 0719 1627], et al., all of the Department of Mechanical Engineering, Qinghua University (40)

Service and Maintenance

The Electric Circuit and Inspection of Isuzu TD 72 Model 8T Truck......Li Zichun [2621 5261 3196], Institute of Plasma Physics, Chinese Academy of Sciences (48)

Inspecting the Braking Force with Lower Pressure on the Reacting Force Type Brake Test Bed......Guo Xiaofen [6753 2556 3083], Xi'an Highway College (52)

A Discussion on Two Factors Influencing Diesel Smoke...... Guan Qiming [7070 0796 2494], Xinxiang Automotive Repair and Parts Plant, Henan (57)

Design Series

Selection of the Type and Design of an Automobile Trailer (Part VIII)......Chen Chuanxin [7115 0278 0207] and Zhang Xiuzhi [1728 4423 5347], both of the Hanyang Automotive Manufacture and Parts Plant (60)

Technical News from Abroad...... (63)

9717
CSO: 4008/6

AUTHOR: LEI Shenyu [7191 1957 0151]
WO Zuquan [3087 4371 0356]

ORG: None

TITLE: "A New Posture for the City of Heroes--Nanchang"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 8, 30 Aug 81 pp 26-27

ABSTRACT: Geographically, Nanchang is the key of communication between China's south and north and it is hence a strategic place in military campaigns throughout the history. In 1979, a monument for commemorating the Aug 1st Uprising [against the KMT] was completed to acknowledge Nanchang as a city of heroes. In these 32 years a tremendous change has occurred to the city. The area has expanded from 8.28 km^2 to 32 km^2 and the population from 220,000 to 680,000 persons. With planned development, the northern part of the city is now a textile center, the southern part machine industry. The chemical industry is located in the east and a cement and bamboo center in the west. An iron and steel industry is also being rapidly established and the city is to become the center of culture for a group of satellite cities of all types. Today's Nanchang is beautiful. The Aug 1st Bridge across Ganjiang measures more than 120 m to link the north and northwest of Jiangxi Province with the south. Aside from describing the new Nanchang, the paper also contains drawings of the monument, the home of ZHU De [2612 1795], and other memorable old buildings.

AUTHOR: WANG Xubo [3076 0650 2672]

ORG: None

TITLE: "Report of Information-Gathering Tours"

SOURCE: Beijing JIANZHU [BUILDING CONSTRUCTION] in Chinese No 8, 30 Aug 81 p 28

ABSTRACT: Most recently, the author and colleagues took a tour of Guanghan, Deyang, Mianyang, etc. [cities in Sichuan Province] to gather sites and sounds of that region. In the suburb of Guanghan, on the banks of Yasihe, they saw a new 5-story building in a very unique design. It has a unit in the center with 3 identical wings and 3 walkways link the units together. In Deyang, they visited the provincial construction engineering machinery plant. In early last year, that factory was in trouble. There was a large quantity of unsold inventories and new outlets were difficult to come by. The management decided to rely upon themselves. A market survey was conducted to find out the needs of the market and the plant started to produce a batch of new products that were sellable. Now a new prosperity prevails. In the suburb of Mianyang, a tall building came into view as they approached the area. This is the new cold storage building. By adopting Prof. HUA Luogeng [5478 5012 1649] 's Total-planning method, from the start to finish, this building took only 3 months.

6248
CSO: 4009/10

Electrical Machinery

AUTHOR: None

ORG: Harbin Electrical Machinery Plant

TITLE: "Product Development of Harbin Electrical Machinery Plant in the Past 30 Years"

SOURCE: Harbin DADIANJI JISHU [LARGE ELECTRICAL MACHINERY] in Chinese No 4, 81 pp 1-4, 25

ABSTRACT: In 1952, the Harbin Electrical Machinery Plant began to manufacture the 800kw water turbogenerator. In 1955, the 10MW hydroelectric power generators began to be made, followed by other new products in 1959, 1964, 1972, and 1980. The plant actually began only in 1955 to produce steam turbine generators. Since then a total of 167 steam turbine generators of a capacity of 11540MW in all have been completed, and from 1952-1980, it produced 200 plus groups of hydroelectrical power generators of a total capacity of 6850MW. It also counts DC power generators among its products and has produced 15847 of these from 1952 to 1980, and 9481 DC electric motors besides. This paper reviews briefly the various types of products made by the Harbin Electrical Machinery Plant in the 3 decades since the liberation.

AUTHOR: CHEN Yaomin [7115 5069 2404]

ORG: Hangzhou Industrial Steam Turbine Research Institute

TITLE: "A Short Introduction of SAP5-Program of Linear Elastic Structure Analysis"

SOURCE: Harbin DADIANJI JISHU [LARGE ELECTRICAL MACHINERY] in Chinese No 4, 81 pp 58-63

ABSTRACT: Since the SAP5 program was imported in the summer of 1979, with the diligent efforts of all the computation stations, its installation has been gradually completed. This was a successful transplantation and the condition for China's engineers to extend the application of the SAP5 program was thus created. Many courses of short durations have been organized throughout the country yet the training facility cannot by any means meet the demand. This paper purports to provide the great number of engineers some understanding of this software. The SAP5 program is a general purpose finite-element method program. Since its development in 1970, its capability of resolving static and dynamic problems in analyzing linear structure systems has been acknowledged to be both comprehensive and versatile. The experience of these years, here and abroad, has proved the result of calculation to be reliable. It is, therefore, a suitable tool for analyzing problems of strength and vibration in dynamics, mechanics, aviation, civil engineering, water conservancy, transportation engineering projects. Asids from introducing the functions of SAP5, flow charts of SAP5C and SAPLOT are also given and techniques of applying SAP5 are briefly explained.

6168
CSO: 4009/29

AUTHOR: WU Dawei [0702 1129 0251]

ORG: None

TITLE: "Cassette Magnetic Tape Recorders Made in China"

SCURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 8, 20 Aug 81 p 42

ABSTRACT: The cassette magnetic tape recorder was first successfully made in Europe in 1963. It does not matter where on the tape the recording has ended, the cassette can always be inserted or taken out and the complicated procedure of threading the tape is eliminated. Moreover, cassettes are so much easier to store and carry and to protect from dust and other foreign matters. In China, the research on making cassette recorders began in 1972. The progress was slow at first because of the poor quality of the movement mechanism of recorders made in China. Improvement was realized in 1978 and since then more than 20 types of cassette recorders have appeared on the domestic market. All of these have been certified by related organizations of the state to meet the national standards for quality and property. Some of these are simple recorders and others are combination radio receivers and recorders. Some of them have all metal parts. These are more difficult to assemble but easier to repair and replace the parts. Others have plastic parts and cost less, but they are difficult to repair. The paper includes some brand names and serial numbers of Chinese made cassette recorders but each individual type is described only very briefly.

6168
CSO: 4009/28

Electronics

AUTHOR: CHENG Heping [2052 0735 1627]

ORG: None

TITLE: "A Special Blue Violet Sensitive Silicon Phototube"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 11 Sep 81 p 14

ABSTRACT: The Semiconductor Research Office of Wuhan University has succeeded in making the special blue violet sensitive ZL-F331 silicon phototube. It has been certified for production in batches. The function of the ground surface station is to receive and transmit telephone and television signals from and to a communication satellite. Sometimes, an arc leap in the waveguide may blow out the very expensive klystron. Due to the fact that the spectrum of the arc light in the waveguide is close to ultraviolet and blue violet, it is necessary to have a detector sufficiently sensitive to these spectra to issue warnings for such occurrence. The ZL-F331 phototube is designed specially for that purpose, but it is also useful for detecting blue violet light for many other needs of protection of a similar nature. The major technical indices of this phototube are given.

AUTHOR: None

ORG: Technology Department, Dalian Radio Plant No 13

TITLE: "Cassette Magnetic Tape Color Video Recorder"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 11 Sep 81 p 14

ABSTRACT: The SL-297 cassette magnetic tape color video recorder has been successfully made jointly by Dalian Radio Plant No 14 and Dalian Research Institute of Electronics. The product has received certification from the National Bureau of Broadcasting and Television Industries and is now being produced in small batches. It is a 3/4 inch all electronic cassette magnetic tape video recorder that meets the international VCS standard. Manual and automatic editing are among its capabilities. The machine will stop automatically if the tape is loose, too fast, etc. There is also a device for remote control operation. The paper includes a description of its major technical parameters.

AUTHOR: MA Shijiang [7456 0013 3068]

ORG: None

TITLE: "The SE-171 Dual Track Portable Oscilloscope"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 11 Sep 81 p 14

ABSTRACT: The SE-171 dual track portable oscilloscope, successfully made by Harbin Electronic Instrument Plant, is a transistorized wide frequency band oscilloscope. It is small (300 x 144 x 400mm external measurement) and light (9 kg in weight.) It is tightly structured and convenient for carrying around. Its design has now been finalized and will be produced in batches.

AUTHOR: None

ORG: Correspondent of the Journal

TITLE: "Continuous Tape Player"

SOURCE: Beijing WUXIANDIAN [RADIO] in Chinese No 9, 11 Sep 81 p 14

ABSTRACT: Shanghai Yongjian Sound Recording Instrument Plant has succeeded, most recently, in making the SZ series tape players. It may be used with a separate recording machine and it may also be used independently to play music or language tapes or as an audio amplifier. The series includes tape players of different design circuits to meet different needs and single track or dual track magnetic heads are both available. It has good antiseismatic and interference resistant properties and is suitable to be used in various vehicles, train stations, exhibition halls, etc. It uses either 12 V or 29 V DC or 220 V AC power sources.

6168
CSO: 4009/37

AUTHOR: ZHAO Shilong [6392 0013 7127]

ORG: Guizhou Provincial Bureau of Water Conservancy

TITLE: "High-Lift Turbine Pump"

SOURCE: Chongqing XIN NENG YUAN [NEW ENERGY SOURCES] in Chinese Vol 3 No 4, 5 Aug 81 pp 44-53

ABSTRACT: In Guizhou, the mountains are high and the water swift and there is an abundance of rainfall; therefore, the hydraulic resources are extremely rich.From 1964 to the present, 8832 hydraulic rams have been installed in the province to irrigate 292,000 mu of fields. Originally, the turbine pumps had a lift of only 40-50 m. The pump casing will break if the lift was made higher. Their bearings were also easily damaged and they did not satisfy the needs of the mountainous regions. The departments of water conservancy, scientific research, and machinery began intensive research in 1968. After numerous changes and experimentations, they began to use rare earth nodular iron to make the pump casing and plastics to make the bearing. These changes brought about a great improvement to the property of the hydraulic turbine pump and they cause the lift to be raised to 263m. Generally, all hydraulic turbine pumps that have a lift higher than 100m are called high-lift turbine pumps. Three types of high-lift turbine pumps made and utilized in Guizhou are introduced. There are many drawings describing the structures and installation of these pumps.

AUTHOR: CHEN Zuohan [7115 0587 3352]

ORG: None

TITLE: "An Effective Water Drawing Tool--The Hydraulic Turbine Pump"

SOURCE: Chongqing XIN NENG YUAN [NEW ENERGY SOURCES] in Chinese Vol 3 No 4, 5 Aug 81 pp 54-59

ABSTRACT: At the Asia and Near East Water Drawing Tool Discussion Meeting called by the UN Food and Agriculture Oranization in Dec 79 in Bangkok of Thailand, the Chinese representative introduced China's unique hydraulic turbine pump. It is a water drawing tool operated by water power. It is composed of the 2 parts of a hydraulic turbine and a hydraulic ram. The hydraulic turbine provides the power for the hydraulic turbine pump and the hydraulic ram is the work part. The total structure is simple and easily made. It consumes neither gasoline nor electricity and it does not pollute the environment. It also serves as a small hydroelectric power station to generate power supply for a small residential community, or for processing grain, lumber, etc. At present, there are about 44,000 hydraulic turbine pump stations in China's 26 provinces, cities, and districts to irrigate more than 5 million 800 thousand mu of fields. The lift of the highest hydraulic turbine pump in China now is 320m. This paper includes descriptions of other water drawing tools, such as the Plata pump of New Zealand, and compares them with the Chinese hydraulic turbine pump. Structural characteristics and economic efficiency of the Chinese machine are discussed.

AUTHOR: QIAN-TIAN Yong [transliteration of Japanese name]

ORG: None

TITLE: "Extracting Fuel Oil From Used Tires"

SOURCE: Chongqing XIN NENG YUAN [NEW ENERGY SOURCES] in Chinese Vol 3 No 4, 5 Aug 81 pp 65-66

ABSTRACT: Three steps needed to extract fuel oil from used tires: heat decomposition; separation, cooling, and condensation; and waste gas treatment, are explained. Generally speaking, from each ton of used tires, 400 kg of fuel oil, 300 kg of carbide, 100 kg of steel scraps, and 200 kg of flammable gas may be reclaimed. This paper is a translation from the Japanese journal, MACHINE DESIGN Vol 24 No 4, 80.

AUTHOR: None

ORG: None

TITLE: "Utilizing the Methane of Mine Pits to Save Coal Resources"

SOURCE: Chongqing XIN NENG YUAN [NEW ENERGY SOURCES] in Chinese Vol 3 No 4, 5 Aug 81 pp 73, 43

ABSTRACT: The Songzao Coal Mine of Chongqing was rudimentarily constructed in 1958 and the safety equipment was not complete. The pits gushed methane. On 13 Apr 62, there was even an explosion. In early 67, an experiment was conducted to pump and release methane from the No 1 pit. After gaining some experience, in Jul 69 a methane pumping station was built but this gradual development was practically halted during the years of 69-76. After the gang of four was brought down, the management of the mine provided more manpower and improved the drill-hole arrangement to improve the quantity of methane released from the pits, but the methane became a pollution problem. Moreover, the workers' residences are built on the hills and coal must be brought up for cooking etc. The families of the workers demanded the leaders to find a way to use the waste methane. Finally, 600,000 yuan of capital was invested to construct a tank of a capacity of 5,000 m^3 to store the released methane. The work began in 1978 and by Feb 80 most of the industrial boilers, workers' dining halls, and residential dwellings have methane for fuel. At present, there is still some methane wasted everyday and the stoves should be designed to burn more efficiently and some boilers still burn coal, but improvements will come gradually.

6248

CSO: 4009/8

AUTHOR: GONG Lin [7895 3829]
WANG Chengyao [3769 2110 1031]

ORG: Both of the Southwest Prospecting Company of Metallurgic Geology, Kunming

TITLE: "On the Origin of 'Dongchuan Type' Copper Deposit"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 203-211

TEXT OF ENGLISH ABSTRACT: The stratiform copper deposits in Laoxue dolomite of the Proterozoic Kunyang Group in Dongchuan District, Yunnan Province, are known as "Dongchuan type" copper deposits. As to their origin, there is a hydrothermal opinion of residual magma differentiation. The authors of this paper think that such deposits have complex characteristics covering the mineralization processes of sedimentation-diagenesis, evaporation-diagenesis as well as metamorphism-reformation. A summary is as follows:
1) Copper-bearing minerals constitute various sedimentary structures, such as cross laminations, ripples, cyclothem, Oölitic, syngenetic conglomerate, etc.
2) The distribution and enrichment of copper ores are controlled by stratigraphy, sedimentary-facies, lithology and sedimento- and bio-geochemical environment.
3) The association of copper minerals with diagenetic dolomite, gypsum, authigenic quartz and the absorption of copper minerals by algae indicated that the bedded

[Continuation of DIZHI KEXUE No 3, 1981 pp 203-211]

copper orebodies and the original ore formations were formed in a diagenetic process.
4) An inheritable relationship between the stratiform copper deposits and the metamorphosed vein shows that, having formed, the stratiform copper deposits have suffered regional metamorphism, contact metamorphism and faulting displacement.

AUTHOR: LI Xingtang [2621 5281 0781]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Mechanism of the Formation of Superimposed Fault and Its Relation to Evolution of Tectonic Stress Field"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 212-222

TEXT OF ENGLISH ABSTRACT: The deformation and displacement along preexisting faults, resulting from the action of engineering load or post-tectonic force on the faulted geologic body and cracked rock mass, are called superimposed faults.

An empirical formula for the relation between the shear strength of tectonite in the fault zone and that of mother rocks is suggested: $tg\varphi = \frac{1}{2}tg\varphi_0$ (where φ and φ_0 are the angle of internal friction for tectonite and mother rock respectively; $S = (1/3 - 1/6)S_0$ (where S and S_0 are the original shear strength of tectonite and mother rock respectively). According to our calculations and analysis, under a new stress condition of α = 10°-70° (where α is the angle between the preexisting fault and maximum principal stress), shear superimposed fault may be formed in the mother rock with internal friction angle φ = 20°. Both α_1 and α_2 are called the critical shear angle, where α_1 and α_2 are the minimum and maximum value of angle α respectively. Therefore, shear superimposed fault can be formed by the preexisting

[Continuation of DIZHI KEXUE No 3, 1981 pp 212-222]

fault under the condition of $\alpha_1 > \alpha < \alpha_2$. In this paper, the suggested critical shear angle α_1 and α_2 of the faulted rock mass for internal friction angles of the mother rock φ_0= 30°, 40°, 50° and 60° are given in the table. As α = 0, a tensile superimposed fault would be formed; as α = 90°, however, compressed superimposed fault (reverse fault, thrust, etc.) would be formed. In the field, as α < 10°. tensile superimposed fault is generally formed; as 10° > α < 70°, shear superimposed fault is generally formed. There is an optimum shear angle or a most dangerous slipping angle α_r among the critical shear angles. Angle α_r represents the angle between σ_1 and the fault plane, along which a shear superimposed fault is most easily formed. The angle α_r = 40° to 20° for mother rocks with φ_0 = 20° to 60° is listed in the table.

Under the action of polycyclic tectonic force in various directions, there exist no more than four sets of original shear faults and six sets of limited faults in a single geologic body. Under a condition of a given recent tectonic stress field, the faults with α equal to or approximately equal to α_r can be considered to be the most dangerous faults or the seismogenic faults in the region in question. Based on the above-mentioned conclusions, the earthquake risk and regional stability of the earth's crust can be predicted and determined. For the regions where there exist deep-seated basement faults with great elongation formed during polycyclic movements and where historically there have occurred a number of earthquakes, or

[Continuation of DIZHI KEXUE No 3, 1981 pp 212-222]

for the Cenozoic rift-valley regions, such as the north China region, Hengduan mountain ranges, etc., α_r can be selected as 40-30°. As for the regions where the basement faults are not on a large scale and earthquakes have occurred more seldom, such as the south China region, angle α_r can be selected as 25-20°.

AUTHOR: HAN Weitian [7281 5588 3944]
CAI Keqing [5591 0344 0530]

ORG: Both of the Beijing Graduate Division, Wuhan College of Geology

TITLE: "Physio-chemical Analysis of Geothermal Metamorphism"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 223-231

TEXT OF ENGLISH ABSTRACT: Geothermal metamorphism discussed in this paper is one of the most important processes of diagenesis of evaporites. Both theoretical and experimental studies of physio-chemical processes enable the writers to conclude that H. Borchert's concept of "progressive geothermal metamorphism" is wrong. The melting of hydrous minerals due to the increase of temperature was the only cause forming the metamorphic liquors, when evaporites were buried deeper and deepes under younger sediments. The melting point of paragenesis of salt minerals must be that of the invariant point in the polythermal diagram. Geothermal metamorphism proceeded in stages with the increasing temperature, and mineral assemblage of each stage should be explained with the polythermal diagram.

AUTHOR: WEI Mingxiu [7614 2494 4423]

ORG: Geological Institute, Ministry of Metallurgy, Guilin

TITLE: "Some New Data on the Crystal Structure of Liujinyinite"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 232-234

TEXT OF ENGLISH ABSTRACT: Liujinyinite found in China, a natural mineral of Ag_3AuS_2, is similar incomposition to uytenbogaardtite discovered by M.D. Barton et al. The new X-ray powder data obtained by using ϕ 114.6 mm Debey-Scherrer camera indicate that the synthetic Ag_3AuS_2 reported in this paper is identical to uytenbogaardtite in its crystal structure, with the space group (S. P) $P4_1$ or $P4_1 22$; D_x 7.9-8.4, a 9.67-9.76, c 9.78-10.10 Å. But liujinyinite with S. P $P4/mmc$ or $P\bar{4}2c$ or $P4mc$; D_x 7.07; a 10.07, c 11.11 Å is clearly different from synthetic Ag_3AuS_2. In the physical and optical properties, liujinyinite shows lower reflectance R 19.3 percent (λ 589 nm) and higher hardness $VHN_{20} = 76.19$. On the other hand, uytenbogaardtite exhibits R 31.1-35.2 percent (λ 589 nm), $VHN_{15} = 20$. The present author prefers that these minerals not be attributed to one kind of mineral beint a polymorph formed under different conditions.

AUTHOR: WANG Wenguang [3769 2429 1639]
ZHANG Shuling [1728 3219 5376]
LU Jun [7120 1498]

ORG: WANG and ZHANG both of the Beijing Institute of Uranium Geology; LU of the Chinese Academy of Geological Sciences

TITLE: "Infrared Spectral Characteristics of Some Common Uranium Minerals"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 235-246

TEXT OF ENGLISH ABSTRACT: Attempting to use infrared spectrometry as a conventional method for identifying uranium minerals in microquantities, the authors studied infrared spectral characteristics of different kinds of uranium minerals. Forty-one species of common uranium minerals collected from different areas in China have been analyzed.

This paper consists of two parts. The characteristics of fundamental vibrational frequencies of molecules in uranium minerals, i.e., H_2O and groups of $[OH]^-$, $[H_3O]^+$, $[UO]^{2+}$, $[XO_3]^{2-}$, $[XO_4]^{3-}$, etc., are summarized in the first part. The description of infrared spectral properties of 53 species of uranium minerals for 10 types are included in the second part. This paper only provides infrared spectral frequencies of various uranium minerals which may be used as a basis for identifying uranium minerals.

AUTHOR: LI Youqin [2621 1635 3830]
JIANG Shaoying [3068 4801 5391]
FAN Wenwei [5400 2429 0251]

ORG: LI of the Institute of Geology, Chinese Academy of Sciences, Beijing; JIANG and FAN both of the Geological Research Institute of Geological Corporation, Ministry of Building Materials Industry, Beijing

TITLE: "Study on the Infrared Spectra of Chrysotiles in China"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 247-253

TEXT OF ENGLISH ABSTRACT: Based on the IR spectroscopic investigation of 75 chrysotile samples from 15 mines in China, we found for the first time that the chrysotiles from the Ji'an mine are mostly orthochrysotile. According to the difference in their structural types and hence the differences in amount, intensity, shape of Si-O vibration bands in the 1100-950 cm^{-1} range and degree of split and degeneration in their IR spectra, the chrysotiles may be classified into three types: clino-chrysotile, (essentially) ortho-chrysotile and the mixture of ortho- and clino-chrysotiles. The symmetry and lattice intensity of their crystal structures are also discussed in this paper.

Our experiments show that the phase transition temperatures of different types of

[Continuation of DIZHI KEXUE No 3, 1981 pp 247-253]

chrysotiles are not identical. An interpretation for the dehydroxylation temperature of chrysotiles is presented.

AUTHOR: ZHANG Kang [1728 2123]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Cambrian Transgression and Stratigraphic Diachronism in the Ordos Region"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 254-258

TEXT OF ENGLISH ABSTRACT: This paper describes the territory of transgression of various stages of Cambrian period. It is proved that Ordos fault block in the shape of a rectangle was preliminarily formed at that time. Trilobite fossils were discovered in the shale intercalation at the top of "Huo Shan Sandstone," indicating that it can be regarded as a lithological unit of diachronism with an age range of from Early to Late Cambrian. Similar phenomena were also found in the other lithological units. With this background, the features of Cambrian diachronism in Ordos region are discussed in this paper.

AUTHOR: ZHANG Zibin [1728 1311 2430]
WANG Ding [3769 0002]
DING Jiaxian [0002 0857 6343]

ORG: All of the Beijing Geological Survey

TITLE: "Environmental Changes Since 13,000 Years Ago in Beijing Region"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 259-268

TEXT OF ENGLISH ABSTRACT: Based on the geological investigation of Holocene strata and peat exploration as well as a great deal of data on various kinds of samples obtained by different methods, such as chemical analysis of core samples, sporopollen analysis, microfossil analysis and radiocarbon dating, etc., a chronological table of Holocene for Beijing region was established. In light of this table we succeeded in reconstructing the natural landscape for the piedmont plain and intermountainous basin in the Beijing region during the past 13,000 years. In this paper the argument is presented that mankind migrated there from piedmont to plain with the retreat of lakes and swamps.

The Holocene strata in the Beijing region can be divided into four groups: the Paleoholocene (13,100 - 10,100 years ago, Fen Zhuang formation), the Early Holocene (10,100 - 7,700 years ago, Gao Li Zhang formation), Middle Holocene (7,700 - 2,100 years ago, Tao Shan formation) and the Late Holocene (from 2,100 years ago to the

[Continuation of DIZHI KEXUE No 3, 1981 pp 259-268]

present, Shin Lietun formation).

Vegetational development indicates that the early stage of Middle Holocene (7,700 - 5,600 years ago) was an optimal warm time of the post-glacial period, while 5,600 - 5,000 years ago the climate became colder than it is at the present time.

AUTHOR: LI Jiliang [2621 4949 0081]
HU Fuyou [5170 6534 0147]

ORG: Both of the Institute of Ceology, Chinese Academy of Sciences, Beijing

TITLE: "The Serpentinitic Olistostrome in Bayanobo Group"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 269-272

TEXT OF ENGLISH ABSTRACT: The Bilute serpentinite found north of Bayanobo was earlier considered to be an ultrabasic intrusive body or a kimberlite pipe. Recently, having observed the inner structure of the serpentinitic piles and the sedimentary structure of underlying and overlying sedimentary rocks, the authors suggest that the serpentinitic rocks can be ascribed to a kind of olistostrome formed due to submarine slump. It is quite evident that the existence of olistostrome can be used to explain the sedimentation and tectonic environments as they were generating.

AUTHOR: CHEN Jinshi [7115 6930 4258]
ZHAO Rui [6392 3843]
HUO Weiguo [7202 5898 0948]
et al.

ORG: All of the Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Sulfur Isotopes of Some Marine Gypsum"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 273-278

TEXT OF ENGLISH ABSTRACT: In this paper, we report the determination of sulfur isotope ratios of 89 marine gypsum (and/or anhydrate) samples, among which 40 samples were collected from Triassic, 38 from Ordovician, 10 from Cambrian and 1 from Sinian strata. The results available are shown as follows:
1) The δS^{34}-value variance of marine gypsum or anhydrate from a single layer less than 40 m in thickness is usually no more than 0.15 percent.
2) The δS^{34}-value of marine gypsum or anhydrate from several (about six to eight) layers in a gypsum-bearing formation also varies within a range of 0.15 percent.
3) The δS^{34}-value variance of marine gypsum in a contemporaneous gypsum-bearing formation is about 0.2 percent for two localities at a distance of 130 km.
4) The δS^{34}-value variance of marine sulfates in a single gypsum-bearing cyclothem vary within a range of 0.2 percent.

[Continuation of DIZHI KEXUE No 3, 1981 pp 273-278]

5) The δS^{34}-values of marine sulfates in a single salt-bearing cyclothem vary within a range of 0.2 percent.

From the results mentioned above, it may be preliminarily concluded that in a sedimentary basin the contemporaneous marine gypsums or anhydrates are very similar in the sulfur isotope compositions, with the variation no more than 0.15 percent.

6) The sulfur isotope analyses of 40 samples from Triassic marine deposits indicate that Lower and Middle Triassic marine anhydrates have a range of δS^{34}-value from 1.49 to 3.24 percent with a variation of 1.75 percent, i.e., 2.83-3.24 percent and 1.49-2.09 percent respectively. Sulfur isotope composition of the Lower Triassic marine gypsum is enriched in S^{34} by about 1.3 percent relative to the Middle Triassic one.
7) According to our data, the δS^{34}-value is 1.88 percent for the Sinian gypsum with a geologic age of 600-640 m.y., for the Lower Cambrian it is 2.53-2.98 percent and for Middle Ordovician it is 2.12-2.77 percent. This trend of variation in δS^{34}-value is comparable to that described by Holser (1977).

AUTHOR: QIAO Guangsheng [0829 1639 3932]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "The Calculation of (^{87}Sr/^{86}Sr) Ratio Value in ^{84}Sr-Spiked Samples"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 279-285

TEXT OF ENGLISH ABSTRACT: The Rb-Sr dating needs, first of all, a precise isotopic analysis of Sr in natural materials. Generally, the ^{87}Sr/^{86}Sr ratio value is always normalized by

$$(^{87}\mathrm{Sr}/^{86}\mathrm{Sr})_N = (^{87}\mathrm{Sr}/^{86}\mathrm{Sr})_M \cdot \frac{(^{86}\mathrm{Sr}/^{88}\mathrm{Sr})_M + 0.1194}{2 \times 0.1194} \qquad (1)$$

This formula, however, is not valid for the Sr-isotope spiked analysis. It requires some modifications dependent on the dilution degree. This paper shows that an infinite series analysis gives a simple formula for calculating the (^{87}Sr/^{86}Sr) ratio value in a spiked sample without the modifications of formula (1).

After the geological samples are diluted by ^{84}Sr spike, the ^{87}Sr/^{86}Sr ratio value can be normalized by formula (1) as it is in unspiked analysis. Then the (^{87}Sr/^{86}Sr) ratio value in the sample can be calculated from the normalized ratio as follows:

[Continuation of DIZHI KEXUE No 3, 1961 pp 279-285]

$$\left(\frac{^{87}\mathrm{Sr}}{^{86}\mathrm{Sr}}\right)_{\mathrm{sample}} = \left(\frac{^{87}\mathrm{Sr}}{^{86}\mathrm{Sr}}\right)_N \cdot \frac{1}{1-\delta}$$

where δ is calculated by

$$\delta = 0.0033\,\frac{c}{c'} \cdot \frac{\left(\frac{^{84}\mathrm{Sr}}{^{86}\mathrm{Sr}}\right)_M - \frac{d}{c}}{\frac{d'}{c'} - \left(\frac{^{84}\mathrm{Sr}}{^{86}\mathrm{Sr}}\right)_M}$$

where c, d and c', d' are isotopic abundance of ^{86}Sr and ^{84}Sr in the samples and in the spike, respectively, and constant 0.0033 is calculated from the isotopic abundance of the spike and the common strontium. In addition, δ can also be obtained from the δ-(^{84}Sr/^{86}Sr)$_M$ plot.

AUTHOR: CHENG Minqing [4453 2404 3237]

ORG: Tianjin Geological Survey, Ministry of Metallurgical Industry, Tianjin

TITLE: "A New Occurrence of Cerium Fergusonite"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 286-290

TEXT OF ENGLISH ABSTRACT: The cerium fergusonite referred to in this paper was found in the Bayan Obo, Nei Monggol Autonomous Region. It occurs in the ore of Nb, TR dolomite type from Bayan Obo group and associates with dolomite, riebekite, magnetite and other rare earth minerals.

This mineral belongs to the tetragonal system, is brown yellow or brown green, luster, grease-vitreous, clear to turbid. The grain size is fine, 0.02-0.07 mm in diameter. The X-ray powder pattern was weak. As the cerium fergusonite heats up to 1000°C the strongest lines are: 3.133 (10), 2.944(8), 2.742(8), 1.907(7), 1.644(6), 1.617(6), 1.570(7), 1.221(5). The unit cell parameters calculated from X-ray powder data are a_0 5.06 Å, b_0 10.96 Å, c_0 5.28 Å. Microprobe analysis gave Nb_2O_5 42.94 percent, ΣCe 11.15 percent, ΣY 38.65 percent, ThO_2 3.14 percent, UO_2 1.87 percent. It is rich in Th but depleted in U. Thus we get the chemical formula as $[\Sigma Y_{0.81}\Sigma Ce_{0.18}(Th, U, Ca, Mn, Fe)_{0.12}]_{1.11}\ [Nb, Ti]_{0.93}O_4$.

[Continuation of DIZHI KEXUE No 3, 1981 pp 286-290]

The coordinated pattern of REE shows its richness in Σ La-Nd, Σ Sm-Ho, but depletion in Σ Zr-Lu. This is in accordance with the country rock.

The cerium fergusonite discovered in dolomite not only gives us a new occurrence of cerium fergusonite, but also shows the presence of an independent mineral of yttrium in Bayan Obo.

AUTHOR: MIAO Xin [4924 2500]

ORG: Scientific Research Institute for Petroleum Exploration and Development, Beijing

TITLE: "The Recognition of 'V'-shaped Impact Pit and Chemical Etching on the Quartz-grain Surface"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 291-293

TEXT OF ENGLISH ABSTRACT: The purpose of this paper is to illustrate our opinion on six photographs of quartz-grain surface features in the appendix to the paper entitled "Grain-size Distribution and Surface Texture of Quartz Grains in Sedimentary Rocks and Their Relation to Sedimentary Environment" published in SCIENTIA GEOLOGICA SINICA No 3, 1980. Based on the characteristics of origin and form of a "V"-shaped impact pit and chemical etching, this paper proposes a method for correctly distinguishing them.

AUTHOR: ZHANG Qirui [1728 0796 6904]

ORG: Institute of Geology, Chinese Academy of Sciences, Beijing

TITLE: "Simple Segmentation of Digitized Sequences of Geological Data"

SOURCE: Beijing DIZHI KEXUE [SCIENTIA GEOLOGICA SINICA] in Chinese No 3, 1981 pp 294-296

TEXT OF ENGLISH ABSTRACT: The optimal section method suggested by Fisher (1958) has generally been adapted in geological studies. But the method first described in a paper by Kulinkovich et al. (1966) and named "simple segmentation" by the present author has always been regarded as inaccurate and negligible. Recently it was found that simple segmentation is a counterpart of the simple-linkage method of cluster analysis in sequential data. The results obtained by this method actually can be comparable to that from the optimal section method. In addition, in some specific geological conditions, many cases have come to show the predominance of the former over the latter, and therefore it is well received by geologists. In addition, simple segmentation is much simpler and more economical than the optimal section method.

9717
CSO: 4009/462

Hydroelectricity

AUTHOR: MA Shoulin [7456 1343 2651]

ORG: Hanzhong District Water Conservancy and Hydroelectricity Team, Shaanxi Province

TITLE: "Preliminary Investigation of Karst in Southern Shaanxi"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER] in Chinese No 8, 20 Aug 81 pp 19-25

ABSTRACT: There is karst distribution in all the counties of Hanzhong and more extensively in Ningqiang, Zhengba and the southern parts of Mian, Nanzheng, and Xixiang counties. Studies on the karst development principle of this area are important in terms of selecting reservoirs, constructing hydroelectric power stations, and mining ground water. The vertical zonal characteristic of karst is a record of movement of the earth's crust. This paper reviews the general condition of geology in this region, morphological characteristics of underground rivers, the condition of deep karst below the rocks of the river beds, and related problems concerning the ground water table. It also points out the complexity of the subject and the urgent need of obtaining reliable knowledge utilizing such new techniques as infrared remoting sensing, geological radar, etc. so as to provide data for the reasonable selection and designing of engineering and construction sites and projects.

AUTHOR: SUN Qingfang [1327 3237 5364]

ORG: Northwest Research Institute of Water and Soil Conservancy and Biopedology

TITLE: "Effects of Covering Materials on Soil Erosion in the Loessial Region"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER] in Chinese No 8, 20 Aug 81 pp 42-44

ABSTRACT: According to observational data of many years of such water and soil conservancy experimental stations as Tianshui, Suide, Lishi, Xifeng, etc. in China's loessial region, on the average forests bring about 70-80 percent of reduction of surface runoff and soil erosion. On a slope of a grade less than 15°, a coverage of 50 percent can reduce 60-80 percent of erosion and that of 90 percent can bring about 90 percent of reduction of erosion. With slopes of a grade above 20°, an 80 percent of reduction of erosion is the result of 90 percent coverage during a rainstorm. In the past several years, the author and colleagues carried out artificial rain experiments, natural rain observations, etc. for a preliminary analysis of the relationship between surface covering materials and soil erosion. Results to date are reported.

6248
CSO: 4009/27

Hydrology

AUTHOR: LONG Yuqia [7893 3022 7505]
XIONG Guishu [3574 6311 2873]

ORG: Both of Huanghe Water Conservancy Committee, Ministry of Water Conservancy

TITLE: "Sediments of Huanghe (the Yellow River) Briefly Introduced"

SOURCE: Beijing SHUIWEN [HYDROLOGY] in Chinese No 4, 25 Aug 81 pp 3-7

ABSTRACT: The drainage basin of Huanghe measures 750,000 km^2 and produces 16 x 10^8 tons of silts and 469 x 10^8 m^3 of runoff per year. Huanghe is the river of the largest quantity of sediments in the world, but the volume of its water is only one twentieth of that of Changjiang. The source of the sediments is mainly the loess of the middle reaches. This loess is of loose texture, with well developed vertical joints. The vegetative coverage is very poor and the earth easily collapses and breaks apart. Most of Huanghe's tributaries have flood peaks of very short duration, varying from several tens of minutes to several hours, while the sand content of the flood water is extremely high. The sediment contents of Huanghe and 3 tributaries measured from 1967 through 1978 are reported. Since 1958, a series of large and medium reservoirs have been constructed and they have blocked a large quantity of sediments from entering Huanghe. This fact is unfavorable for maintaining the useful life of these reservoirs, however. Since the liberation, ways have been adopted to build these reservoirs and to use silt-containing water for irrigation to keep 137 x 10^8 tons, amounting to 28.5 percent, of sediments from Huanghe. Results of these measures are briefly analyzed.

AUTHOR: LI Fengwu [2621 7364 0582]

ORG: Jingzhou Branch, Hubei Provincial Water Conservancy Station

TITLE: "Method of Forecasting the Crest Stage at Shashi on Changhiang (the Yangzi River)"

SOURCE: Beijing SHUIWEN [HYDROLOGY] in Chinese No 4, 25 Aug 81 pp 20-23

ABSTRACT: The water level at crest stage at the city of Shashi is the basis for flood prevention engineering of the Jingjiang section of the Yangzi. Normally, the crest level (flow volume) of the Cuntan Station in the upper reach is used for continuous calculation to estimate the level at Yichang, which is used as the basis to predict the crest level of Shashi. From Yichang downward, the Yangzi enters the plain-lake region and there are also tributaries with a total drainage area of 23,958 km^2, however, and the Dongting Lake has an obvious backwater effect on the water level at Shashi. The margin of error in forecasting the crest level of Shashi on the basis of the computed level at Yichang is analyzed. Three methods of correction under the condition of tributary and backwater-free, the condition of backwater effects, and the condition of additional water from Qingjiang [a tributary] respectively are introduced. The accuracy of forecasting with the complex formula suggested in the paper is evaluated.

AUTHOR: NIU Zhan [3662 0594]

ORG: Bureau of Water Conservancy, Huanghe Water Conservancy Committee

TITLE: "Application of Satellite Image in the Revision of Physiogeographical Regionalization Map of the Middle Reaches of Huanghe"

SOURCE: Beijing SHUIWEN [HYDROLOGY] in Chinese No 4, 25 Aug 81 pp 24-27

ABSTRACT: The Huanghe Planning Committee compiled the Physiogeographical Regionalization Indicative Map of Huanghe Valley in 1954, but with the limited field survey of the time, it was difficult to produce a very accurate map. With the development of science and technology since then, the condition for its revision has been gradually met. The color synthesized images in a scale of 1:500,000 of the Earth Resources Satellite have been utilized by the author and colleagues and in coordination with related geological, geographical, and hydrological data and taking into consideration such factors as the origin of sediments, the composition of the surface materials, and the vegetation, a revision of the map has been completed. The satellite images were taken from Jun to Sep 76 and synthesized from the positives of MSS4 (0.5-0.6 μ m wavelength) MSS5 (0.6-0.7μm) and MSS7 (0.8-1.1μm). The colors thus synthesized basically reflect the natural ground surface conditions of the middle reaches of Huanghe. The process of interpreting these images, the resultant regionalization of the middle reaches of Huanghe, and the hydrological sediments in the various physiogeographical regions are briefly introduced.

AUTHOR: TANG Qicheng [3282 1142 2052]
CHENG Tianwen [4453 1131 2429]
ZHAO Chunian [6392 2806 1628]
LIU Enbao [0491 1869 1405]

ORG: All of Research Institute of Geography, Chinese Academy of Sciences

TITLE: "Hydrological Feature of the Area of Qilian Mountains"

SOURCE: Beijing SHUIWEN [HYDROLOGY] in Chinese No 4, 25 Aug 81 pp 41-45

ABSTRACT: The Qilian Mountain region includes the plain of Hexi Corridor to the north and the northern part of Chaidamu Basin to the south of the mountains, with a total area of 350,000 km^2, the mountains occupying a third of the area. The region contains different topographical units. The large streams are all in the northwest--southeast direction and the valleys are all more than 10 km in width. There are many areas in the mountains more than 5000m in altitude and thick moraine, pluvial, and alluvial materials, well developed in the intermountain valleys, have a great effect on the hydrological condition of the mountain streams. Estimated annual runoff of the Hexi Corridor and that of northern Chaidamu are discussed in detail. The alpine glacier snow melt occupies a large proportion of the annual runoff and it is concentrated in the summer, amounting to 60-80 percent of the supplement for these streams. For the further development of the rich mineral resources and fertile grain fields of this region, the first consideration is the surface and ground water resources. Extensive mining of ground water and diverting surface water to areas of insufficient and mineralized ground water are recommended.

AUTHOR: None

ORG: Flood Control Office of the Huaihe Commission

TITLE: "A Summary of the Catastrophic Rainstorm of the Huaihe Valley in Aug 75"

SOURCE: Beijing SHUIWEN [HYDROLOGY] in Chinese No 4, 25 Aug 81 pp 46-52

ABSTRACT: In the early part of Aug 75, after the typhoon landed in Fujian Province, it turned into a low pressure system pushing inland to reach Henan Province and caused a rainstorm lasting continuously for 3 days to create floods in the Huai River valley. The flood water of the upper reaches of its tributaries rushed down and overran embankments of the middle and low sections of the streams to cause tremendous losses of lives and properties and great damages to the national economy. After the catastrophe, the Ministries of Water Conservancy and Meteorology organised related units to carry out many surveys and analyses. The resultant data were compiled and a large number of reports and papers have been published on the subject. Based upon these materials, this paper presents a summary of the natural condition of the region, the condition of the rainstorm, and an analysis of the contributing factors of the catastrophic rainstorm.

6248
CSO: 4009/7

Marine Engineering

AUTHOR: XIONG Lisheng [3574 4539 3932]

ORG: None

TITLE: "Inspiration From Fish Tails"

SOURCE: Beijing JIANCHUAN ZHISHI [NAVAL AND MERCHANT SHIPS] in Chinese No 8, Aug 81 pp 17-18

ABSTRACT: Nature has given men a wealth of inspirations, as men observe nature and ask such questions as why can fish leap, or why can birds fly, etc. Many new scientific and technological inventions got their start from these questions. Inspired by the way fish and dolphins swim, men have invented 2 new types of propellers: the fish fin propeller and the hydraulic pulse propeller. These are new attempts of applying bionics to mechanical engineering. The fish fin propellers are quiet, safe, and produce very little eddy current. The power transmission system is a back-and-forth motion; therefore, the piston movement of the motor can be directly delivered to the tail-fin-shaped propeller blade and there is no necessity of converting into a rotary motion and the efficiency may thus be increased. Shortcomings of this type of propeller are the fact that the structure is relatively complex and the speed cannot be very high with the back-and-forth motion. The theory, structure, and merits of the hydraulic pulse propeller are explained also; at present, France and Norway are known to be experimenting with this type of propellers.

AUTHOR: LIN Yujie [2651 5940 2638]

ORG: None

TITLE: "Sea Floor Spectaculars"

SOURCE: Beijing JIANCHUAN ZHISHI [NAVAL AND MERCHANT SHIPS] in Chinese No 8, Aug 81 pp 24-25

ABSTRACT: The head of the Department of Cable Repairs of the Sea Floor Cable Construction Company telephoned the author to report the sudden interruption of communication of the long distance sea floor communication cable, which the organization to which the author is affiliated helped to lay just a year ago. The department asked for the recently imported SM358 Lock-Out submersible to go on a cable inspection tour. When the carrier boat Kancha reached the area of the sea of the suspected trouble, 3 men, including the author, got in the submersible and went down to the ocean bottom, where, close to 1000m from the surface, they found the strange spectacle of a whale of the Class Odontoceti, dead and all tangled up by the cable, which was broken. The twisted cable on the body of the whale measured more than 40 m. Obviously the whale had thought the cable to be a fish and proceeded to catch its favorite food. There is a drawing in the paper depicting the various parts of the submersible.

6248
CSO: 4009/9

Meteorology

AUTHOR: ZHANG Yuling [1728 3768 3791]

ORG: Department of Geophysics, Beijing University

TITLE: "Heavy Rainfall and Formation of Sub-synoptic Systems"

SOURCE: Beijing QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA] in Chinese No 3, Aug 81 pp 257-266

TEXT OF ENGLISH ABSTRACT: A five-level PE-model was applied to simulate the formation of sub-synoptic systems using real data of rainfall amount and geopotentials. Experiments indicate that due to the releast of latent heat through a condensation process in the numerical model a convergence zone and a sub-synoptic vortex develops in the precipitation region. The low level jet stream with a scale of about 500 km is located along the south side of the heavy rain area. The wind profile, vertical circulation and location of low level jet relative to the heavy rain area are in agreement with average structures of the Meiyu front. The dry numerical model cannot give similar results.

AUTHOR: FENG Lingmin [7458 7227 2404]
WANG Wuzai [3769 0063 0961]
ZHOU Zidong [0719 4793 2639]

ORG: All of the Academy of Meteorology, Central Meteorological Service

TITLE: "Some Experiments of Data Assimilation Utilizing Multiple-instant Wind Data"

SOURCE: Beijing QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA] in Chinese No 3, Aug 81 pp 267-276

TEXT OF ENGLISH ABSTRACT: By using multiple-instant wind data, some experimental results of low latitude data assimilation are discussed. The empirical orthogonal iteration method is used in data assimilation. Two methods for constructing data matrices are tested and compared. In the first method, the wind components are treated separately in two different matrices. In the second method the wind components are treated as two elements in one matrix. Results show that the latter is better than the former. It is indicated that the obtained assimilation values are useful information for objective analysis.

AUTHOR: XING Runan [6717 1172 2809]
CHAO Jiping [1560 4764 1627]

ORG: Both of the Institute of Atmospheric Physics, Chinese Academy of Sciences

TITLE: "Numerical Experiments of the Atmospheric Circulation Responses to the Sea Surface Temperatures in the Tropical Regions"

SOURCE: Beijing QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA] in Chinese No 3, Aug 81 pp 277-286

TEXT OF ENGLISH ABSTRACT: The responses of atmospheric vertical circulation to the anomalies of the sea surface temperatures in tropical regions are computed numercally with a two-level primitive equation model in the tropical regions for two cases: (1) anomalous warming and (2) anomalous cooling.

It is shown in our experiments that there is an opposite developing trend between the Walker circulation and Hadley circulation which was discovered by Chinese meteorologists. We have further developed Bjerknes' hypothesis. It is indicated that the east-west gradient of the ocean temperature in the tropical regions may play a major role in the formation of the two perpendicular vertical circulations.

AUTHOR: WANG Zonghao [3769 1350 4110]

ORG: Institute of Atmospheric Physics, Chinese Academy of Sciences

TITLE: "A New Difference Scheme for the Primitive Dynamic Equations of the Atmosphere"

SOURCE: Beijing QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA] in Chinese No 3, Aug 81 pp 287-297

TEXT OF ENGLISH ABSTRACT: A new type of explicit difference scheme, the stable criterion of which is free from time step τ and space grid length d, is presented. Its stability is only determined by $m_e = [\frac{\tau}{d}\lambda_e]$ (e = 1, 2, 3), the positive integer part of $\frac{\tau}{d}\lambda_e$, where $\lambda_1 = u+c$, $\lambda_3 = u-c$ denotes the eastward and westward gravity wave speed respectively, and $\lambda_2 = u$ denotes the Rossby wave speed. As a numerical test of the present schemes, equations given in the article were used in solving the one-dimensional shallow water wave equation, with $d = 25$ km and $\tau = 20$ minutes. The table and figures show examples of the calculated results.

AUTHOR: GUO Qiyun [6753 0366 5686]

ORG: Institute of Geography, Chinese Academy of Sciences

TITLE: "Comparative Studies of General Circulation in the Northern and Southern Hemispheres in Relation to the Sea-level Pressure Harmonics"

SOURCE: Beijing QIXIANG XUEBAO [ACTA METEOROLOGICA SINICA] in Chinese No 3, Aug 81 pp 298-310

TEXT OF ENGLISH ABSTRACT: Zonal harmonic analysis is carried out for monthly sea-level pressure along four latitude belts (30°N, 30°S, 50°N, 50°S) for the period from 1951 to 1960. The characteristics of the calculated ultra-long wave show that: (1) There are two kinds of variations of the general circulation, seasonal and unseasonal. In the Northern Hemisphere, in which the continent-ocean contrast is large, the seasonal variation is significant in both subtropical and temperate belts. In the Southern Hemisphere it is dominant only in the subtropical belt, while in the temperate belt the unseasonal variation is more evident. (2) There are significant interannual variations of the seasonal course in both the Southern and Northern Hemispheres. The beginning of summer in the Northern Hemisphere and the ending of summer in the Southern Hemisphere change obviously from one year to another. But the beginning of the northern summer has much greater stability as does the ending of the southern summer. (3) The interannual variation of the positions of ultra-long waves is associated closely with the distribution of

[Continuation of QIXIANG XUEBAO No 3, Aug 81 pp 298-310]

continents and oceans. The dominant ultra-long waves are more stable in the latitude belt in which the continents occupy a great portion of the area. In the 50°S belt, in which the ocean consists of 90 percent or more of the area, the positions of ultra-long waves vary greatly from one year to another, independent of whether they dominate in this latitude belt.

9717
CSO: 4009/15

Nonmetallic Ores

AUTHOR: YU Yang [0151 3152]
LIU Changlian [0491 7022 6647]

ORG: Both of Suzhou China Clay Company Research Center

TITLE: "A Study on Strong Magentic Separation of Suzhou Kaolin"

SOURCE: Beijing FEIJINSHU KUANG [NONMETALLIC ORES] in Chinese No 3, 28 Aug 81 pp 1-6

ABSTRACT: Resources of Suzhou kaolin are extremely rich. The mines are old and the quality of the ore is excellent, but due to backward mining and separation techniques, the product quality has not reached the international advanced level. In the middle 70's, the authors carried out a series of experiments in the following 2 categories: (1) SQC-2 magnetic separation; (2) High gradient strong magnetic separation. The iron content of Suzhou kaolin exists mainly in the form of ferric hydroxide, distributed in grains of about 10 μm in diameter, with specific magnetization coefficient of 40×10^{-6} cm^3/g. A machine of relatively great magnetism is needed to remove from the ore such fine and weak magnetic grains. With the cooperation of Jiangxi Color Metallurgy Research Institute, the SQC-2 wet type strong magnetic separator was made. Other organizations, such as Beijing Research Academy of Iron and Steel, Dalian Steel Plant Research Institute, etc. contributed to making Fr-Cr-p-C noncrystalline steel bristles, etc. for experiments of the second category. Problems and results of the experiments are reported.

AUTHOR: ZHAO Xize [6392 6007 3419]
CHANG Juyi [2545 1565 0034]
GUO Yiqing [6751 1150 3237]

ORG: ZHAO of Geology Company, Ministry of Construction Materials; CHANG, GUO of Shaanxi Geological Prospecting Brigade

TITLE: "Investigations Into the Geological Characteristic and Genesis of Kaolin Mine in Baishuijiang of Lueyang, Shaanxi Province"

SOURCE: Beijing FEIJINSHU KUANG [NONMETALLIC ORES] in Chinese No 3, 28 Aug 81 pp 9-16

ABSTRACT: The Baishuijiang kaolin mine is located in the northwestern edge of the Qinling system of fold. After manual dressing, the ore is suitable for making ceramics of daily uses, and sometimes for making objects of art. Aside from a general discussion of the lithological, geological, and mineral-genetic characteristics of the kaolin deposits of this area, this paper also includes data of differential thermal analysis, x-ray powder crystallographic analysis, trace element spectrographical semi-quantitative analysis, and x-ray diffraction analysis of the kaolin ore and the country rocks.

AUTHOR: PAN Shuqi [3382 2579 3823]

ORG: Deqin Asbestos Mine

TITLE: "Application of Air Passing Through Separator in Deqin Asbestos Mine"

SOURCE: Beijing FEIJINSHU KUANG [NONMETALLIC ORES] in Chinese No 3, 28 Aug 81 p 58

ABSTRACT: Deqin is a small mine of less than 1000-ton output a year. The quantity of tailings varies with the quality of pre-dressed ore and the dressing process. When the quantity of ore input is greater than 12 tons/hour, the quality of the tailings rises to above 1 percent. With this problem in mind, the author and colleagues designed and made a simple air-passing-through separator, for three-repeated absorption dressing. After more than one year's use in production, the separator has been proved to be of simple structure, low manufacturing cost, safe and reliable operation and it does not stir up dust. If a fiber drop and a horizontal sieve are attached to the separator to remove dust and to grade the ore, finished asbestos fiber may be obtained. The equipment has the shortcomings of inability to reclaim long fibers and efficiency reduction whenever the material input is too fast. A drawing of the separator and its technical conditions are included.

6248
CSO: 4009/25

AUTHOR: ZHOU Nan [0719 0589]

ORG: None

TITLE: "Several Methods for Elementing 50Hz High Voltage Electricity Interference"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 4, 15 Aug 81 pp 84-87

ABSTRACT: When seismic prospecting is being carried out in a region of a power network, 50Hz high voltage electrical interference occurs regularly. A study of the causes reveals that the following aspects are involved: direct coupling of the 50Hz alternating electromagnetic field to the input terminal of the instrument through its capacitance-inductance components to form 50Hz induction; induction of the AC electromagnetic field; 50Hz induction induced by power leakage; and high resonance wave interference of the 50Hz city power supply. On the basis of the above understanding, the following measures are adopted: (1) Arrange the instrument in such a manner as to avoid irradiation by the AC electromagnetic field; (2) Keep the shop clean and the insulation in good condition to prevent power leakage; (3) Add a 50Hz wave trap to the instrument; (4) Use a digital detector, or if an analog detector is used, rearrange the connection to weaken the high voltage power induction. Reasons for the effectiveness of these measures are explained.

AUTHOR: PAN Yaojia [3382 1031 0857]

ORG: None

TITLE: "An Example of Interpreting Oil and Gas by Using Low Velocity Anomalies"

SOURCE: Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 4, 15 Aug 81 pp 91-92

ABSTRACT: Hexiwu District has been extensively surveyed with seismic prospecting technology. The main survey line has reached 500m and the connecting lines have also reached 1 km, but the distribution of oil and gas is still not clarified to date. Using a large quantity of velocity spectral data (2 velocity spectra per km) as the basis, every velocity point is seriously and precisely interpreted to reject the velocity points corresponding to various wave anomalies and the velocity points that are unrelated to effective reflected wave. The selected velocity points are then rectified through the angle of inclincation so that the superimposed velocity may be viewed as the mean square root velocity. Using the Dix equation to calculate the layer velocity of all strata and finding the average layer velocity within an area of 100 m to obtain a composite curve, which may be used to predict the sandstone and mud ratio. Statistical data indicate that compared with the drill well data, the sandstone-mud contents determined by this method have a relative difference of only 4-7.4 percent. Hence, this composite curve can be used to predict oil and gas. Using this method, the paper predicts that in the section of the No 13 negative anomaly, corresponding to A56, A59, industrial oil and gas may be obtained.

CSO: 4009/12

AUTHOR: FENG Guoqiang [7458 0948 1730]

ORG: None

TITLE: "Brief News of A Scientific Report Meeting"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 4, 20 Aug 81 p 64

ABSTRACT: On 25 Apr 81, the Research Institute of Prospecting Technology called a meeting in Beijing to report the Donghai Longyi Well drilling technology. Participants included more than 120 delegates representing National Bureau of Oceanography, Ministry of Petroleum, Bureau of Science and Technology of the Ministry of Geology, Bureau of Petroleum, Bureau of Hydrology, Wuhan College of Geology, Research Academy of Prospecting Technology, and the Center of Prospecting. For the purpose of clarifying China's petroleum and natural gas resources in the continental shelf of the East China Sea, the South Sea Command of the Ministry of Geology successfully completed the drilling of Longyi Well to a depth of 3469.46m and the intended purpose of clarifying the oil and gas containing stratigraphic location was accomplished. Engineer WANG Zhongying [3076 0112 5391] who participated in the slush pump work introduced the general condition of the drilling work, with emphasis on the slush design and the work process, adopting the theory of pressure equilibrium and "d" exponent law. The drilling work was carried out under extremely adverse conditions of the sea with a water depth of 77 m and many layers of high pressure were encountered after a drilling depth of 3000 m.

AUTHOR: GEN Yan [5087 6056]

ORG: None

TITLE: "Brief News"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 4, 20 Aug 81 p 64

ABSTRACT: Two short items are included in the paper: (1) In early Apr 81 the Bureau of Equipment Industry of the Ministry of Geology held product quality examination meetings in Wuxi to inspect the SH30-2 Engineering Drill produced by Wuxi Mineral Prospecting Machinery Plant and the Diamond Hole Expansion Device produced by Wuxi Drill Tool Plant. Both products were deemed to be of excellent quality. The certification procedure is briefly introduced. (2) In May 81, the Bureau of Equipment Industry of the Ministry of Geology called a certification meeting in Wuxi to inspect the CYC-J50 Wagon Drill which is jointly made by the Wuxi Mineral Prospecting Machinery Plant and the Research Institute of Prospecting Technology. It is designed to meet the needs for geological prosecting work in civilian construction, highway, railway, bridge, dam, and national defense engineering projects. Three related organizations test-drilled 15 holes of a cumulative footage of 519.75 m with the largest hole as deep as 80 m to inspect the various properties of the drill equipment. All 100 delegates at the certification meeting were satisfied with the equipment except for the desire of adding the feature of disassembling capability so that it may be used in less accessible areas. The producers expressed willingness to comply with this requirement as soon as possible.

6248
CSO: 4009/21

AUTHOR: QIN Guogang [4440 0948 0474]
ZHANG Yufeng [1728 3768 1496]
DU Yongchang [2679 3057 2490]
et al.

ORG: All of the Department of Physics, Beijing University

TITLE: "A New Method for Investigating Mid-gap Levels by DLTS and Transient Capacitance Measurements"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 169-181

TEXT OF ENGLISH ABSTRACT: Deep-level impurities or defective centers in semiconductors are very often multiple-leveled. It is shown that if one level of such a multiple level center is near the mid-gap, one can obtain the ratio of its electron and hole emission rates $e_n(T)/e_p(T)$ (thermal) from the ratio of its DLTS peak to that of another level of the center (or from the ratio of their initial transient capacitances). With additional use of the value of the DLTS rate window (or time constant of the transient capacitance), the values of $e_n(T)$ and $e_p(T)$ of the mid-gap level can be separately determined. Therefore one can further determine the level position in the gap and the extrapolated value of the forbidden gap width at 0 K. DLTS (high temperature) and transient capacitance (low temperature) measurements have been made on Au-doped Si and the values for $e_n(T)/e_p(T)$, $e_n(T)$, $e_p(T)$

[Continuation of BANDAOTI XUEBAO Vol 2 No 3, 1981 pp 169-181]

of the gold acceptor levels are determined. The results are close to those obtained by other methods as reported in the literature. The accuracy of the method is discussed and the possibility of using this method for identification of impurities and defective centers is indicated.

AUTHOR: WANG Yongchen [3769 3057 2525]
ZHU Yimin [2612 3015 2404]

ORG: Both of Tianjin Electronic Materials Research Institute

TITLE: "Vapor-phase Epitaxial Growth of Submicron GaAs Layers and High Resistivity Buffer Layers"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 182-188

TEXT OF ENGLISH ABSTRACT: The process of the preparation of the double-layered epitaxial material used for 6 Gc and 12 Gc FET is described. In our present work high resistivity buffer layers of 3-5 μm thickness have been obtained as well as active layers which have a thickness of 0.2 - 0.30 μm, a concentration of 1-1.5 $10^{17}/cm^3$ and a mobility of 4500-4870 $cm^2/V{\cdot}s$. The electrical data of the layers with and without buffer layers are listed. The FET from such material has a noise factor of 2.8 dB and 3.5 dB, and a gain of 7-9 dB and 4.0 dB at 6 Gc and 12 Gc respectively.

Another method for the preparation of high resistivity buffer layers is also given with $AsCl_3$ containing AsOCl, and a short discussion is presented.

AUTHOR: WANG Shouwu [3769 1343 2976]
WANG Zhongming [3769 0112 2494]
XU Jizong [6079 4949 1350]

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Deep Level Luminescence of GaAs-$Ga_{1-x}Al_xAs$ Double Heterojunction Laser"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 189-196

TEXT OF ENGLISH ABSTRACT: The luminescence spectra at various spatial positions perpendicular to the junction plane of a DH laser have been studied. For certain wavelengths the spatial distribution of the luminescence was also investigated. The experimental results show that the deep level radiation peaks at wavelengths of 1.03 μ and 1.09 μ (called D_1 and D_2) appeared throughout the region of N-GaAs substrate, N-GaAs buffer layer and P-GaAs active layer. The intensity of those peaks became maximum in the buffer layer nearby the active region about 3-6 μm away from the N-n heterojunction. Under enhanced aging with lower current density (heat sink temperature 70°C, current density $500A/cm^2$) the intensity of the two radiation peaks slightly increased and the position of the maximum moved toward the N-n heterojunction, but after thermal treatment at 800°C the intensity of the two peaks evidently decreased. In addition, it was discovered that there was also a deep level radiation peak at a wavelength of about 1.03 μ in the P-GaAs active

[Continuation of BANDAOTI XUEBAO Vol 2 No 3, 1981 pp 189-196]

region (D_1'). This radiation peak, however, would not be affected by the thermal treatment, and during enhanced aging with lower current density its intensity was significantly reduced, which agrees with the fact that the threshold current density decreases in the early period of the aging process. It was also found that the luminescence spectrum of N-$Ga_{1-x}Al_xAs$ layer has a radiation peak with a wavelength shorter than that of the band to band transition in the active region. It can be considered that this radiation peak results from the recombination of the holes bound by the Sn deep acceptor with the electrons which appeared in the N-$Ga_{1-x}Al_xAs$ layer due to the existence of the potential barriers in the conduction band at N-p heterojunctions.

AUTHOR: SHAN Yongzheng [0830 3057 2398]
DU Baoxun [2629 1405 0534]

ORG: Both of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "A Theoretical Analysis of Transmission Characteristics of Semiconductor Lasers"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 197-211

TEXT OF ENGLISH ABSTRACT: In this paper transmission characteristics of semiconductor lasers are analyzed based on classical control theory. In the case of small signals, semiconductor lasers are considered an isolated linear system and the rate equation describing its physical process is linearized; four sorts of transmission functions showing its transmission characteristics have been obtained by using network theory; response characteristics to optical-electrical input signals and corresponding equivalent network are then given according to the transmission functions, and transmission characteristics of semiconductor lasers are, in turn, analyzed and synthesized according to the transmission functions and the equivalent network.

AUTHOR: ZHU Longde [2612 7893 1795]
ZHANG Shenglian [1728 4141 1670]
WANG Xiaojie [3076 1321 2638]
et al.

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Proton-defined Stripe Geometry InGaAsP/InP Double Heterostructure Lasers"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 212-221

TEXT OF ENGLISH ABSTRACT: InGaAsP/InP four layer double heterostructure wafers have been grown by liquid phase epitaxy. The conditions needed for growing InGaAsP/InP and InP/InGaAsP heterojunctions with flat interfaces and high crystal quality have been investigated. The heterojunction lattice mismatch was measured and LPE conditions for lattice matched-heterojunctions established. The influence of various concentrations of Te and Zn in the melt on the carrier concentrations in the LPE layers of InP as well as the effect of zinc doping conditions on the junction position, injection efficiency of the p-n junctions and other junction properties were investigated. Stripe geometry InGaAsP/InP DH lasers were fabricated by the use of proton bombardment. The wavelength of the lasers operating continuously at room temperature (300 K) was 1.30 - 1.33 μm. The room temperature threshold current density of the broad contact lasers was 2000 A/cm^2 and the normalized

[Continuation of BANDAOTI XUEBAO Vol 2 No 3, 1981 pp 212-221]

threshold current density was 5 kA/cm$^2 \cdot \mu$. The temperature dependence of the threshold current between 80-330 K was measured and the characteristic temperature T_0 was found to be 79-108 K in the range of 80-285 K, and around room temperature T_0 = 63-73 K. Continuous operation of more than 3000 hours has been achieved under atmospheric conditions.

AUTHOR: JIANG Guanhui [3068 7070 6540]

ORG: Nanjing Solid State Device Institute

TITLE: "Unusual Change in Forward Barrier Capacitance and Its Application to Parametric Varactors"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 222-233

TEXT OF ENGLISH ABSTRACT: Based on a complete analysis of P^+-N junction's forward capacitance, a new impurity profile model that leads to an unusual change in P^+-N junction's forward barrier capacitance is presented in this paper. The features of this model are: the changed speed and amplitude of the junction capacitance at forward bias are faster and larger than those in the abrupt model. The new model is used in the fabrication of GaAs parametric varactor diodes with 0.08 - 0.25 pF. The results show that the capacitance variation factor is increased, the higher zero-bias cutoff frequency is obtained and required pump power of parameters is decreased. The fabricated GaAs parametric varactors exhibit zero-bias cutoff frequency of 400-700 GHz and capacitance variation factor of 0.17 - 0.225. The parameter only needs the pump power of 10-20 mW.

AUTHOR: T. Itoh
RAO Dexiang [7437 1795 4382]
H. Tamura
Y. Ohkubo

ORG: Itoh, Tamura and Ohkubo all of the School of Science and Engineering, Waseda University; RAO of the Beijing Second Semiconductor Device Factory

TITLE: "Pulsed Electron Beam Annealing Apparatus and Annealing of As-implanted Silicon"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 2 No 3, 1981 pp 234-239

TEXT OF ENGLISH ABSTRACT: We have developed a low voltage operation E-B apparatus which can be used for single pulsed E-B processing of semiconductor surfaces. The apparatus consists of a high density electron source and an electron beam irradiation chamber, and is operated in a He environment at about 10^{-5} Torr.

Silicon (100) wafers were implanted at room temperature with 50 keV As^+ of $10^{15}/cm^2$ and $10^{16}/cm^2$ duration at 8 keV. Rapid diffusion of As atoms was observed in this case. The annealing mechanism of lattice damage is that the liquid-phase epitaxial regrowth initiating from the substrate occurs by means of pulsed E-B irradiation.

9717
CSO: 4009/494

Transportation Construction

AUTHOR: XIAN Lishi [0341 4539 1807]

ORG: None

TITLE: "The Gezhou Dam Sanjiang Highway Bridge Completed"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 81 p 15

ABSTRACT: After passing through precipitous mountains, the Sanxia [Three-gorges], and Nanjinguan, the Changjiang [Yangzi River] enters a plain and its surface widens suddenly in Yichang City, where the Gezhou Dam and West Dam divide the river into 3 channels. On the large channel (Dajiang) a giant power generating system will be constructed. The second channel (Erjiang) is to release flood water and a power generating station is to be constructed there as well. The third channel (Sanjiang) is for navigation. On 1 May this year, a highway bridge across Sanjiang was completed. This bridge has the greatest load bearing capacity of all China's bridges to date, and trucks weighing 54 tons can pass over it without problem. Its main span measures 158m, the second longest in China. The width of the bridge is 11 m, with a 1.5 m wide sidewalk on each side and 2 center lanes for motorized vehicles. Under the bridge, large ships of the ten-thousand ton class can pass through. Now that it is completed, vehicles and materials can be delivered to the Water Conservancy Headquarters construction site directly for the second stage construction project. It will have an important effect on accelerating the engineering schedule of the Gezhou Headquarters and on improving the livelihood of the people of Yichang.

AUTHOR: ZOU Dedong [6760 1795 2767]

ORG: None

TITLE: "Odong Highway Leads to Everywhere"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 81 p 15

ABSTRACT: In the Huanggang District of eastern Hubei, at the foothill of Dabie Mountains, a black-topped highway may be seen like a black ribbon fastened halfway up the mountain. This highway connects Henan Province in the north and Anhui Province to the south, stretching out 306 km to link 9 counties of the 3 provinces. Along this major highway, many black topped branch-roads spread out, winding through the surrounding peaks, gorges, and valleys to reach all the 4866 brigades of the 186 communes of the 12 counties (cities) of the entire Dabie Mountain region of eastern Hubei. The region now has 6242 km of highways, with 822 highway bridges. The region also has 5555 domestic-make automobiles, 137 times the number of preliberation days. In the old days, it took 3 days on land and 1 day on water to travel from Luotian to Hankou. Today, despite all these mountains, the same journey takes only 5 hours. Now, from any place in east Hubei, an automobile can reach Beijing, Shanghai, and Wuhan. There are also buses in these mountains, including overnight stops in villages for the convenience of commune members.

AUTHOR: CHEN Yuanmou [7115 6678 6180]

ORG: None

TITLE: "The Currently Being Constructed Yanshi Railway"

SOURCE: Beijing DILI ZHISHI [GEOGRAPHICAL KNOWLEDGE] in Chinese No 8, 81 p 15

ABSTRACT: The work on constructing the railway from Yanshou to Shijiu officially began in early Apr this year. This is an engineering project of economic cooperation between China and Japan. It starts from Yanshou on the Tianjin-Pukou Rail line and will stretch 300 plus km across the low hills of the southern part of Shandong Province to reach Shijiu on the edge of the Yellow Sea. The Shijiu Harbor is located between Lianyungang Harbor and Qingdao [Tsingtao] and has a stable coastline, deep water, and good geological condition. When the deep water pier of this harbor is finished, it will be able to handle the export of 10 million tons of coal and the import of 5 million tons of iron ore every year. The railway and the harbor will have a great effect on foreign trade as well as on the development of agriculture and industry of southern Shandong.

6248
CSO: 4009/33

Underground Engineering

AUTHOR: PEI Ruishu [5952 3843 3796]

ORG: None

TITLE: "New Cement Injecting Technique Has a Great and Promising Future"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, 11 Aug 81 pp 1-4

ABSTRACT: A certain person of the Ministry of Civil Defense succeeded in creating a new technique of injecting cement, after repeated research and experimentation. Two rollers of the injector rotate in opposite directions by electric motors in a very high speed, and concrete that has been evenly mixed in a given ratio of materials are injected onto the surface of rocks or dirt by the centrifugal force produced by the rotating rollers. Compared with the cement gun, the injector is simpler, the strength of the injected concrete is reliable, the cost of constructing the support structure is lower, there is less back up, there is less dust, the operating technique is easier to master, and it is more convenient to add additives to the slurry. The structure of the injector is described and a simple drawing is included. Tests of the concrete formed by the injector for its compressive, tensile, bending, and shear strength,and for modulus of elasticity were performed by Sichuan and Chongqing Departments of Civil Defense. The test data are included in the paper.

AUTHOR: SU Baoye [5685 0202 2814]

ORG: None

TITLE: "The Construction Design of the Underground Plant of a Certain Machine Factory"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 8, 11 Aug 81 pp 17-22

ABSTRACT: The undergound plant has 22,000m^2 of construction area, not including the area of the tunnel, and 200,000m^3 of rocks were excavated for it. The plant includes rooms for equipment, stamping and welding shops, maching shop, machine repair shop, metering room, central testing laboratory, etc. and there are also a storage place, a boiler room, and washrooms. Its designing began in 1973 and the construction was completed in 1976. Underground machine plants were designed and built in the 60's in China, but due to lack of experience there was no proper drainage protection to prevent dampness while the noise reduction measures were also less than effective. Some of those were repeatedly repaired but not all the problems were entirely resolved. Some had to build another surface plant and move out of the underground site. The design of this building is based upon the lessons and experiences of the past to guarantee that the production needs of the factory are met, to create a work environment even better than that of above ground plants, and to consider the special requirements of the specialty which is to occupy the plant. The floor plan, the support structure, the noise insulation, and several technical and economic indices of the underground building are described.

6248

CSO: 4009/26

AUTHOR: ZHOU Deqing [0719 1795 3237]
TIAN Yuhong [3944 1342 1347]

ORG: Both of Research Institute of Modern Physics, Chinese Academy of Sciences

TITLE: "Experimental Research on the 20KGHe + 77KLN_2 Condensation Pump"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 4, 25 Aug 81 pp 4-10, 48

ABSTRACT: Such modern sciences as the space technology, aviation, and nuclear energy industry exact a series of strong demands from vacuum technology, such as: (1) high and ultra-high vacuum; (2) extremely high pumping speed; (3) exhausting an extremely great quantity of gas; (4) strictly clean and contamination-free; (5) producing a vacuum system of complex geometric shape, etc. Exhausting gas at extremely low temperatures, known as cryogenic pumping, is the technique for satisfying these demands. This paper reports an experiment using the 20KGHe plus 77KLN_2 cryopump. The experiment is divided into 2 parts: a laboratory experiment and a simulated theoretical computation, to compare the results. The pressure and the pumping speed are measured and the properties of the 20KGHe cyclic cryopump are discussed.

AUTHOR: HE Chuanda [0149 0278 1129]

ORG: Beijing Environmental Engineering Experiment Center

TITLE: "Vacuum Gas Exhausting Techniques of Space Simulators"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 4, 25 Aug 81 pp 23-29

ABSTRACT: Space vehicles that fly beyond the earth's atmosphere will receive various effects of low atmospheric pressure (vacuum) and other conditions of the space environment. Of these, the vacuum environment by itself can cause mechanical deformation of structure, thermal changes of parts, charge puncture of electrodes, gas release of materials, sublimation, cold welding, etc. If other conditions of the space environment are taken into consideration, such as low temperature, solar radiation, charged and uncharged particles, etc. the effects will be too numerous to list. In the past 2 decades, progress in vacuum technology has provided the basic condition for various forms of space simulation. The gas exhausting system using mainly the oil diffusion pump, that using mainly the titanium pump and ion pump, that using a composite of different cryopumps (especially liquid helium) are briefly introduced. Other related problems of producing the required vacuum system are discussed.

6168
CSO: 4009/24

END

JPRS 79301

27 October 1981

China Report

SCIENCE AND TECHNOLOGY

No. 133

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79301

27 October 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 133

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

New Furnace Solves Titanium Casting Problems (KEXUE SHIYAN, No 9, 1981) 1

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Accomplishments of Organic Chemist, Huang Weiyuan, Extolled (Lo Changping; JIEFANGJUN HUABAO, No 8, 1981) 2

PUBLICATIONS

Table of Contents of 'JI CHUANG' No 8, 1981 4

HONG KONG MEDIA ON CHINA

APPLIED SCIENCES

Use of 'SKW-9' Single Launch Vehicle for Three Satellites Described (WEN WEI PO, 25 Sep 81) 6

ABSTRACTS

COMMUNICATIONS

TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS], No 3, 1981 10

GENETICS

YICHUAN XUEBAO [ACTA GENETICA SINICA], No 3, Sep 81.................... 17

IRON AND STEEL

GANGTIE [IRON AND STEEL], No 7, 1981.................................... 19

PHYSICS

NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SEPCIAL PHYSICS ISSUE)], 1980...................................... 30

WULI XUEBAO [ACTA PHYSICA SINICA], No 8, 1981........................... 40

TELECOMMUNICATIONS

DIANXIN JISHU [TELECOMMUNICATION TECHNOLOGY] No 8, 10 Aug 81............ 50

APPLIED SCIENCES

NEW FURNACE SOLVES TITANIUM CASTING PROBLEMS

Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 9, 1981 inside back cover

[Photograph and caption]

In a joint effort, the General Hospital of the People's Liberation Army Shenyang units and the Liming Machinery Company have developed China's first vacuum titanium casting furnace. Already in service, the furnace has solved problems associated with smelting titanium and titanium alloys for high quality titanium replacements for human bone tissue.

CSO: 4008/10

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ACCOMPLISHMENTS OF ORGANIC CHEMIST, HUANG WEIYUAN, EXTOLLED

Beijing JIEFANGJUN HUABAO [LIBERATION ARMY PICTORIAL] in Chinese No 8, 1981 pp 32-33

[Article by Lo Changping [7482 2490 1627]: "Taking Root in the Soil of the Motherland"]

[Text] In the spring of 1977, a nearly 60 year old Chinese read his dissertation in English before the Chemistry Department Academic Society of Massachusetts University in the United States. This dissertation was on research and development achievements of a new type fotanhuangsuanyan [8636 8955 4337 6808 7770] for yi gewuji [2117 9459 7212 0495], an accomplishment which earned the enthusiastic applause of his American colleagues. This was China's famous organic chemist, Professor Huang Weiyuan [7806 4850 0997].

Professor Huang Weiyuan's ancestral home is Putian, Fujian Province. As a young man he graduated with honors from Xiehe University in Fujian and entered the Lingnan University graduate school in Guangzhou where he taught while studying, obtaining his master's degree. Subsequently, Huang Weiyuan went to the United States where, in a period of somewhat more than 2 years, he completed his dissertation on the "transformation of cholic and sterol," which won him a doctorate from Harvard University. By this time the motherland had been liberated, and New China's birth exerted a powerful attraction on the heart of this newborn babe on the opposite shore of the Pacific Ocean. Though working comfortably in the United States and enjoying a liberal salary, he was determined to return to China to serve his motherland.

As a result of the Korean War, which was going on at that time, the United States government prohibited students of engineering, physics, and medicine from returning to China, and though he made numerous requests, they were all rejected. In 1954, Huang Weiyuan and several score young Chinese students evaded the watchful eyes and ears of the Federal Bureau of Investigation by using a vacation as the pretext for assembling at the seashore near Boston to discuss a strategy, and published in the "Christian Science Monitor" their joint letter of protest. After the revered Premier Zhou heard of this, he was extraordinarily concerned about these young students, and on two occassions issued a protest to the United States government. Following the Geneva Conference, Huang Weiyuan's hopes were finally realized. At this time, his wife, Chen Yufeng [7115 3768 7685], received permission to join him in the United States, and prepared to study for a masters degree in Harvard University's department of education. Huan Weiyuan dissuaded her from doing so, and resolutely set out on his return journey to the motherland.

Following his return to China, Huang Weiyuan was assigned to the Shanghai Organic Chemistry Institute of the Chinese Academy of Sciences to continue his organic steroid chemistry research. In the course of 3 years, he completed almost 10 treaties. When in the late 1950's the USSR broke faith and withdrew its experts, Huang Weiyuan became extremely angry. He categorically gave up his own specialty and several times took up research in national defense science. Many people were concerned for him, but he said, "Without a strong national defense, our motherland will be pushed around!" For more than 20 years, he and his assistants, students, and People's Liberation Army technicians struggled night and day in the laboratory to make major contributions for the development of national defense industries. From fluoride materials critically needed in national defense to flurocarbon blood substitutes, there was nothing to which he did not devote his blood and sweat. More than 10 research results filled in gaps in the country, and some projects stood in the front ranks internationally. In 1959, Huang Weiyuan gloriously joined the Chinese Communist Party.

Who would ever have supposed that thisscientist who had faithfully rendered service to the motherland would suffer oppression during the 10 years of choas. But he had no words of complaint, firmly believing that the dark clouds over the motherland would pass away. Following the smashing of the "gang of four," the party instituted policies for him, and today he is deputy director of the Shanghai Organic Chemistry Institute, and deputy editor of the HUAXUE XUEBAO [CHEMISTRY BULLETIN]. In 1978, he was made a national labor hero, and this year he was made a member of the academic department of the Chinese Academy of Sciences. Though he is almost 60 years old, Huang Weiyuan has made up his mind to "put down the roots of the tree of his life perpetually and deeply in the soil of the motherland," and devote all his talents to the great mother that has already nurtured him, the motherland.

9432
CSO: 4008/4

PUBLICATIONS

TABLE OF CONTENTS OF 'JI CHUANG' NO 8, 1981

Beijing JI CHUANG [MACHINE TOOL] in Chinese No 8, 1981 p 1

[Text] Design and Research

Dynamic Behavior of Slideway......Hu Jiabin [5170 0857 1755], Machine Tool Research Institute, First Ministry of Machine Building (2)

Light Modulated Phase Gratings......Wang Zhonghu [3769 1813 4375], Machine Tool Research Institute, First Ministry of Machine Building (6)

Application of Silicon Controlled Speed Regulating System with Potential Negative Feedback on Machine Tool...... Chen Zhenmeng [7115 2182 1322], Machine Tool Research Institute, First Ministry of Machine Building (8)

Spindle Head with Torque Motor Used for EDM......Lei Mingda [7191 7686 6671] and Guo Jiajian [6753 1367 1017], both of the Machine Tool Research Institute, First Ministry of Machine Building (10)

A New Type of Two-axis Hydraulic Profiling System...... Li Fulin [2621 4395 2651], Dalian Combined Machine Tool Research Institute (12)

Improvement of the Construction of Gear Grinding Machine Type Y7132A......Chen Daochu, et al. (16)

Technology and Equipment

Problems in Double-end Grinder Development for Crossed Shaft Grinding......Lu Yunfang (20)

Machine Parts Repaired by Oxyacetylene Spray Welding...... Li Shirong [2621 0013 2837] and Ying Ling [5391 3781], both of the Sichuan Internal Combustion Engine Parts Plant (22)

The Tangential Mechanism for Worm Wheel Machining with Fly-cutter......Wang Xiangzhen [3769 5046 7201], State-operated Xudong Machine Building Plant (24)

The Cutting Depth of Gear Shaping......Qian Wenhan [6929 2429 3466], Xi'an Jiaotong University (25)

Inspection and Measurement

A Testing Device for the Mesh Accuracy of the Rotator of a Screw-compressor......Xiong Zenan [3574 0463 3948], Xi'an Jiaotong University (27)

An Automatic Measuring System for Honing......Li Xuehai (29)

Retrofit and Maintenance

The Use of Planet Gear Mechanism in the Headstock of a Lathe......Wu Yongqiang [0702 3057 1730] and Pan Wubiao [3382 0523 2871], both of the Guangzhou Shipbuilding Plant (32)

Improvement of the Stick-slip Behavior of the Column Guideways in Boring Machine WD200......Jia Puzhao [6328 2528 3564], Station 511, Seventh Ministry of Machine Building (33)

9717
CSO: 4008/468

USE OF 'SKW-9' SINGLE LAUNCH VEHICLE FOR THREE SATELLITES DESCRIBED

Hong Kong WEN WEI PO in Chinese 25 Sep 81 p 2

[Article: "The Secret of the 'SKW-9'"]

[Text] In the early morning hours of 20 September, a huge launch vehicle lifts off from somewhere in China. Lifting straight up at first, it then executes a slight turn, streaks through the sky, and is quickly lost to view. China has made its ninth successful satellite launch. It is called Scientific Experiment Satellite No 9, or "SKW-9" for short. [From the first letters of each element of kexue shiyan weixing]

Three satellites comprise SKW-9. The launch made use of one launch vehicle, inserting three satellites into orbit simultaneously in a technique known as a one-rocket-multiple-satellite launch.

The orbits for all three satellites are more or less the same, with a perigee of 240 kilometers and an apogee of 1,610 kilometers; the angle of inclination to the equatorial plane is 59.5 degrees. The satellites make one revolution of the Earth every 103 minutes. The three satellites exhibit different shapes. The heaviest satellite is composed of two frustum-shaped sections that [together] resemble a large bell. Mast antennas extend from the top and sides of the uppermost section, antennas which have continuously emitted radio waves since the satellite went into orbit. The lightest satellite is spherical, composed of a metallic sphere and a balloon which are connected by a thin wire. The remaining satellite is the main component of SKW-9. It is a one-meter-high octagonal prism with a diameter of 1.2 meters. Four rectangular solar battery panels are symmetrically arrayed around the top of the prism. These panels convert solar energy to electrical energy to power the various electronic instruments aboard the satellite. For the main mission of SKW-9, physical surveys of the upper atmosphere, there are a dozen sensors. Some of these measure the atmospheric density at various points through which the satellite travels. Some measure the magnetic fields of the upper atmosphere. Some measure the infrared and ultraviolet radiation of the geo-atmospheric structure and the quantity and energy of protons and electrons in the upper atmosphere; some specially measure solar X-rays and ultraviolet rays. The data thus collected will provide information on space environment and background which will enhance the growth of China's space technology.

After the satellites were inserted into orbit, radio telemetry systems were activated, continuously transmitting high-altitude physical data, satellite orbital flight time data, internal temperature of the satellite and other engineering data. Upon receiving these radio signals, the ground stations immediately know the various physical changes in the satellite, a process known as real-time remote sensing. Since the radio waves are broadcast directly, when the satellite flies out of Chinese airspace, the signals can no longer be received. As a result, the satellite is equipped with memory devices which are capable of recording information during these periods of time so that when the satellite again flies over Chinese airspace these data are transmitted to the ground, a process known as time-delayed telemetry. SKW-9 has both real-time and delayed-time telemetry means, giving us the ability to obtain survey data from all over the globe.

Fig. 1. Optical television theodolite keeps rocket's movement under close observation.

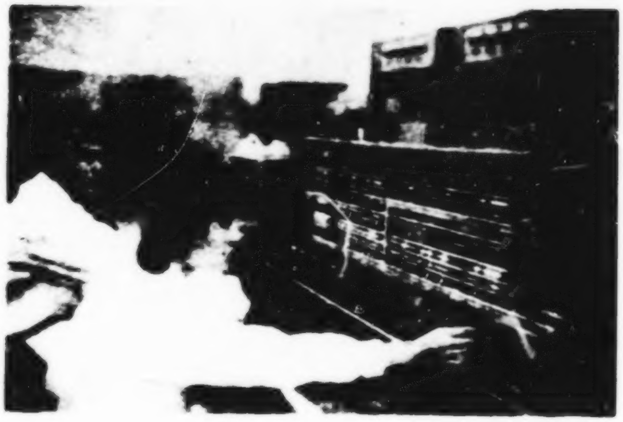


Fig. 2. Radar communications systems go into action.

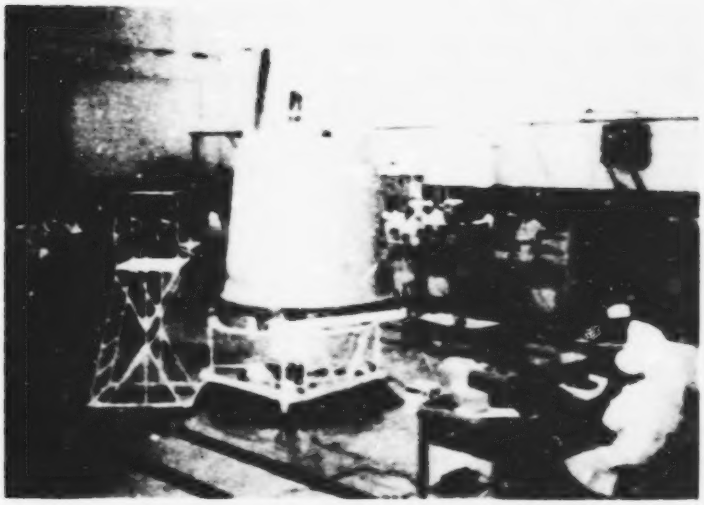


Fig. 3. Scientific personnel subject Space Physical Measurement Satellite No 10 to pre-launch inspection.

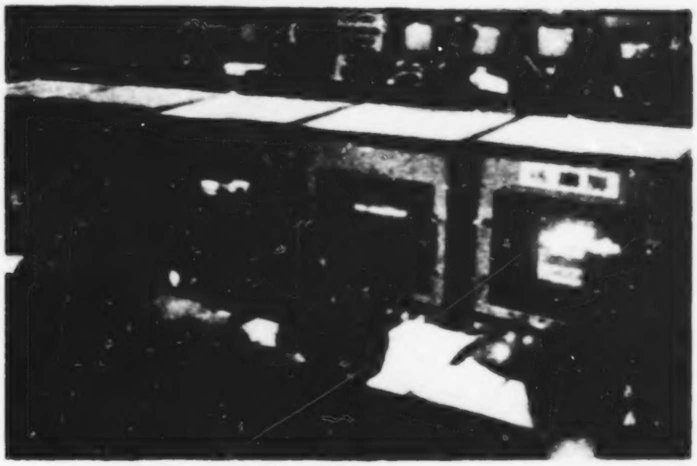


Fig. 4. After the space physical measurement satellite goes into orbit, ground monitoring station tracks the satellite.

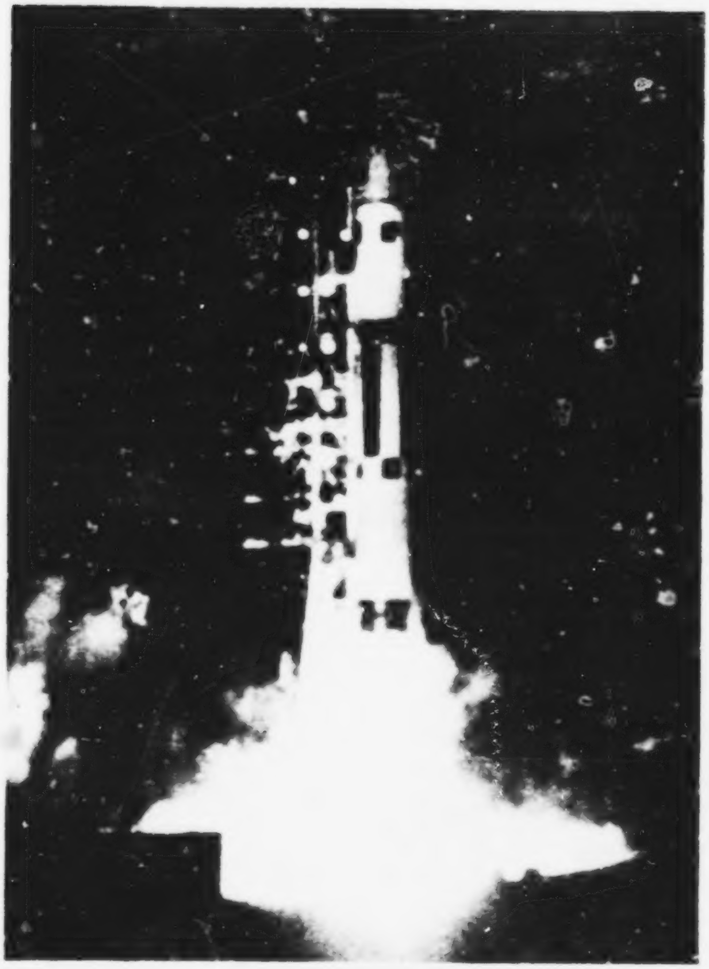


Fig. 5. China successfully launches a batch of space physical survey satellites on 20 September, marking the nation's first use on a single launch vehicle to orbit three satellites. The satellites are inserted into orbit and all systems function normally, sending back an uninterrupted flow of information from experiments and measurements to Earth. Photograph shows rocket at moment of ignition.

CSO: 4008/8

AUTHOR: ZHANG Zhaozhi [4545 3564 2972]

ORG: China Institute of Communications

TITLE: "Capacity of Order α for Strongly Indecomposable Channel"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: In this paper the upper and lower capacities of order $\alpha(\alpha > 0)$ are defined for finite state channel. We have shown that the two capacities are equal when the channel is strongly indecomposable. Thus we can simply call them the capacity of order α for strongly indecomposable channel. In addition, we have proved that the capacity of order α, denoted by C_α, is a non-decreasing and continuous function of the variable α. With these results, we can represent the upper and lower bounds of the probability of decoding error in terms of the capacity of order α for strongly indecomposable channel and easily obtain the coding theorem and its strong converse.

AUTHOR: TIAN Yongzheng [3944 3057 2973]
LIU Shunying [0491 7311 5391]

ORG: Both of the China Institute of Communications

TITLE: "Bit Synchronizer for Split Phase Coded Data"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 7-17

TEXT OF ENGLISH ABSTRACT: For extraction of clock signal from a noisy split phase coded data stream, three different types of nonlinear-filter synchronizer are described in this paper. All three types can produce spectral line component at clock frequency and its harmonics. Formulas for evaluation of the power of the clock frequency component and of the timing error due to bandlimited white noise are derived. In addition, it is pointed out that the performance of some types of synchronizer is relatively independent of the signal statistics. The cost of this advantage is the increased bandwidth required to transmit phase split symbols.

AUTHOR: XIE Chufang [6200 5710 2455]

ORG: China Institute of Communications

TITLE: "Radiation with Walsh Waves"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 18-25

TEXT OF ENGLISH ABSTRACT: After a brief description of the properties of Walsh functions and some of their applications, in this paper we place special emphasis on the discussion of the radiation properties of antennas excited by Walsh waves. The radiation patterns and directivities of a dipole antenna and antenna arrays excited by sinusoidal and Walsh waves are compared. The directivity of an array excited by weighted Walsh current has also been calculated.

AUTHOR: MA Chen [7456 2525]

ORG: China Institute of Communications

TITLE: "A Supplement to the Magnetic Coupling Theory Expounded in the 'International Directives' for Telecommunication Line Protection Against High Tension Lines"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 26-30

TEXT OF ENGLISH ABSTRACT: This paper gives, in line with the advance of modern geophysics, a magnetic coupling theory between high tension and telecommunication lines by considering the earth to be made up of any number of stratified horizontal structures. It proves theoretically at the same time that the results according to the two-layer theory given by the present "International Directives" is merely a special case of the results according to the theory given in this paper.

For purposes of application, the infinite integration is evaluated by a simple method and applied curves are given. The necessity of our supplement is illustrated by numerical results.

AUTHOR: HE Xizhe [0149 1585 0772]
LIU Huanzhang [0491 3562 4545]
XU Guoxu [6079 0948 6103]
HU Xiuzhen [5170 4423 3791]

ORG: All of China Institute of Communications

TITLE: "TRAPATT Oscillators for Second Harmonic Extraction at 10 cm Band"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 31-38

TEXT OF ENGLISH ABSTRACT: In this paper, simplified waveforms of voltage and current of a TRAPATT device have been presented and analyzed. The relationship between device parameters and second harmonic impedances has been set up. The requirements for an approximate design of a TRAPATT oscillator have been worked out. TRAPATT oscillators for second harmonic extraction at 10 cm band have been successfully constructed by using $N^+ PP^+$ type silicon TRAPATT diodes with shallow diffusion junction. They can deliver output power of 160~210 w with 10~15 percent efficiency and less than 10^{-4} of frequency stability over a range of frequency from 2700 MHz to 3300 MHz (with pulse width of 0.5 μs and duty cycle of 1/1000). The oscillators possess, moreover, the advantages of wide tunable frequency range, good output, random noise wave suppression ability, etc., and also have fairly good mechanical reliability. Thus a solid state 10 cm transmitting source of

[Continuation of TONGXIN XUEBAO No 3, 1981 pp 31-38]

unitary pulse system may be used in such equipment as a 10 cm transponder, radio beacon transmitter, airborne altimeter, friend-or-foe identification transmitter, etc.

AUTHOR: YE Peida [5509 1014 1129]
ZHANG Jingxian [1728 7234 1288]
XI Shaolin [1598 1421 7207]

ORG: All of the China Institute of Communications

TITLE: "Optimization Design of Microwave Multiplexing and Demultiplexing System Using Pseudo-complementary Filters"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 39-44

TEXT OF ENGLISH ABSTRACT: This paper consists of: (1) an analysis of pseudo-complementary filter, (2) optimization design method and (3) a design example.

AUTHOR: YUAN Huiren [5913 1920 0088]
PENG Yunlou [1756 0061 2869]
XUE Yinzhang [5641 0692 4345]
et al.

ORG: All of the China Institute of Communications

TITLE: "The Measurement of Antenna Parameters by means of Radioastronomical Method"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 45-52

TEXT OF ENGLISH ABSTRACT: The basic principle and method of using the moon as calibration beacon in the measurement of antenna parameters are presented in this paper. In this method, we use loads of liquid nitrogen at low and normal ambient temperatures as standards of calibration, and use switch-type radiometer for calibration. The aperture and operating wavelength of the measured antenna are respectively 5 m and 7.5 cm. The feeder of the same antenna consists of horns of hybrid-mode developed by the Shijia Zhuang Communication Laboratories. The results of measurement show that this radioastronomical method can give satisfactory antenna parameters. It is accurate and simple. Moreover, it can be used to measure the background noise temperature of the antenna, which is a parameter unobtainable by classical methods of measurement.

AUTHOR: XIE Huaiyan [6200 2037 1750]

ORG: China Institute of Communications

TITLE: "Broadband Waveguide Circulator"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 53-65

TEXT OF ENGLISH ABSTRACT: This paper gives a theoretical description of the working modes and impedance matching conditions of a three-port broadband waveguide circulator. The circulation effect obtained by using two TM1,0,-1 modes in a triangular ferrite resonator is discussed. A numerical analysis of the tapered admittance transfer device is given, and the design of a broadband waveguide circulator with very low loss has been worked out.

AUTHOR: HUANG Yicheng [7806 0001 2052]

ORG: China Institute of Communications

TITLE: "Requirements for the Junction of Two Lumped-parameter Two-port Networks Being Connected"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 66-69

TEXT OF ENGLISH ABSTRACT: In this paper, the condition that no additional fluctuation will be produced while two two-port networks are being connected is expounded by means of scattering parameters S22a or S11b being zero. Using match condition as the connecting condition is thus considered to be not very appropriate. Formulas for calculating additional fluctuation in case neither S22a nor S11b is zero are given. Especially, when $|S11b \cdot S22a| \ll 1$, bounds of maximum fluctuation of additional working attenuation Δb_{max} are given by equations in the article. An equation is also given that may be used to find out the bounds of the product of two reflecting coefficients $|S11b \cdot S22a|$ when the bounds of additional fluctuations are given. Finally, the principle of subducing additional fluctuation by insertion of attenuators is explained by using the said connecting conditions and the extent of subducing is calculated.

AUTHOR: LU Haihuan [0712 2189 1403]

ORG: China Institute of Communications

TITLE: "Packet Satellite Communication"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 70-76

TEXT OF ENGLISH ABSTRACT: In recent years the packet satellite (PACSAT) communication system, which is a new multiple access scheme, has been proposed. This scheme is designed to increase the channel efficiency for data switching and integrated voice switching. Now diverse schemes are still being put forward. In this paper we have described the origin and way of development of packet satellite communication and pointed out its status and function in the future.

AUTHOR: CHEN Shangqin [7115 1424 0530]

ORG: China Institute of Communications

TITLE: "The Main Methods in Pattern Recognition"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 77-87

TEXT OF ENGLISH ABSTRACT: Recently, pattern recognition (PR) techniques have been broadly used in engineering (including communication engineering) and daily life. The most important aspect in designing a PR system is the suitable selection of the recognition method. The PR methods may be classified into two main classes, i.e., decision theory method and syntactic (structural) method. The latter may be classified further into trivial and stochastic methods. In this paper, the principal concept, techniques, comparisons and development of these methods are discussed and illustrated with examples.

AUTHOR: HUANG Mingguang [7806 2494 0342]

ORG: China Institute of Communications

TITLE: "On the Noise Optimum Design of Carrier System"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 91-93

TEXT OF ENGLISH ABSTRACT: This paper suggests that the optimum noise design of a carrier system is to be realized by using the curved preemphasis formulas including three parameters.

AUTHOR: ZHOU Shixiong [0719 1597 3574]
SHI Zhenmo [2457 2182 1075]

ORG: Both of the China Institute of Communications

TITLE: "A Brief Introduction to 'Telematic'"

SOURCE: Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese No 3, 1981 pp 94-96

TEXT OF ENGLISH ABSTRACT: In recent years several new kinds of services have been developed and put into public use in some telecommunications-advanced countries. Telematic is a unified name given, together with associated recommendations, by CCITT in 1980 to certain kinds of new services.

The concept of Telematic, its significance, its typical services and working systems are given in this paper.

9717
CSO: 4009/22

Genetics

AUTHOR: CUI Meiying [1508 2734 1758]
XU Jiujin [1776 3773 3866]
ZHOU Xianting [0719 2009 1656]

ORG: All of the Institute of Genetics, Chinese Academy of Sciences

TITLE: "Smoking and Sister Chromatid Exchanges"

SOURCE: Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese No 3, Sep 81 pp 222-227

TEXT OF ENGLISH ABSTRACT: The analysis of sister chromatid exchange (SCE) frequencies is a useful tool for the study of damages in genetic material of human beings induced by environmental mutagens and carcinogens. In the present study the 33258 Hoechst plus Giemsa method was employed to distinguish the sister chromatid. The frequencies of SCE in the peripheral lymphocytes of 13 middle-aged males were analyzed so as to compare the "spontaneous" and MMC-induced SCE frequencies of smokers with those of non-smokers. It was found that the smokers had a significantly higher SCE frequency (8.33 ± 1.08) than did non-smokers (4.41 ± 0.72), $P < 0.001$. When the cultured cells were treated with various dosages of MMC, the SCE frequencies in smokers were also remarkably higher than those in non-smokers ($P < 0.01$). The difference between SCE frequencies of smokers and non-smokers is increased with the increase of MMC dosage. Since the formation of SCE is related to the mechanisms

[Continuation of YICHUAN XUEBAO No 3, Sep 81 pp 222-227]

of post-replicational repair of DNA damage, the difference in SCE frequencies reflects the difference of recombinational repair systems in organisms. Thus, the variance of SCE frequencies in smokers and non-smokers shows that there is a difference in their DNA repair systems, and smoking might well have changed the capacity to repair the DNA damage.

AUTHOR: ZHU Lihuang [2612 4539 3552]
HU Naibi [5170 0035 3880]
LIANG Zhiguo [2733 1807 0948]

ORG: All of the Institute of Genetics, Chinese Academy of Sciences, Beijing

TITLE: "Comparison of the Translation Capability of Heterologous Interferon Messenger RNA between Normal and Antiviral States of Whole HeLa Cells"

SOURCE: Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese No 3, Sep 81 pp 233-240

TEXT OF ENGLISH ABSTRACT: Mouse interferon mRNA, extracted from NDV (Newcastle disease virus)-induced Lpace-cells, has been translated in whole HeLa cells, and the production of mouse interferon in HeLa cells during translation was reproducible with an average yield of 72 units/ml. However, mouse interferon mRNA was no longer translated in HeLa cells in antiviral states after treatment with human interferon. This phenomenon may be involved in the mechanism of antiviral action of interferons.

9717
CSO: 4009/39

Iron and Steel

AUTHOR: AN Yunpei [1344 0061 3099]

ORG: Research Institute of Anshan Iron and Steel Company

TITLE: "Study of Trajectory of Material Flow through Experimental Full-scale Model"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 1-8

TEXT OF ENGLISH ABSTRACT: The falling trajectories of coke, sinter and pellets have been measured by means of high-speed photography in an experimental 1:1 model of the charging device of a blast furnace. A theoretical calculated equation has been checked and derived. The range of selective value of calculating equation has been recommended.

A discussion of the relationship between the falling point and the depositing peak position of charge on the stockline level and the variation of peak position when the furnace is on blast is given. It is pointed out that the peak position will move toward the outside under the influence of the wall and resistance of gas flow and the formation of the 'V' shape profile of stockline level in the large blast furnace. Therefore it is necessary for the large blast furnace to employ movable armor or bell-less distribution techniques.

[Continuation of GANGTIE No 7, 1981 pp 1-8]

When sinter and pellets were used, the principle in the design of the large bell angle is to make the falling point of the charging burden reach the largest horizontal distance from the center of the furnace. Thus, the optimum slope angle of the large bell should be in the range of 42-48°.

AUTHOR: MA Shuhan [7456 2885 3211]
YANG Guopan [2799 0948 4162]

ORG: Both of the Research Institute of Anshan Iron and Steel Company

TITLE: "On the Optimum Distribution and Control of Gas Flow in Blast Furnace with Low Fuel Rate"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 9-17

TEXT OF ENGLISH ABSTRACT: This paper discusses the relations between the optimum distribution pattern of gas flow, the size of furnace and behavior of raw materials, etc., with low fuel rate, based on practical operation of blast furnaces at home and abroad in association with the investigation of furnace dissection, survey of charging profile at the stockline level before blowing in and measurement of raceway depth. It is thought that under the present conditions, with improved burden materials more plain CO_2 curve of the double peak type, 'W' and 'inverted V' shape of softening melting zone are to be sought.

The control of the distribution of gas flow and the shape of the softening melting zone depends on parameters of flowing and the charging method so as to obtain the optimum depth of the raceway and the optimum ratio of ore and coke at the throat. Improving the high temperature behavior of raw materials and fuel and their grain size constituents is the basis of the optimum distribution of gas flow.

AUTHOR: LIU Bingduo [0491 4426 6995]

ORG: Anshan Institute of Iron and Steel Technology

TITLE: "A Study of Ideal Charging Batch Weight in Blast Furnace"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 18-24

TEXT OF ENGLISH ABSTRACT: This article discusses the fact that the weight of ore batches not only has an influence on the gas distribution of the furnace, but also on the efficiency of the gas utilization. In the author's opinion, only such an ore batch that can prove both the smooth running of the furnace and the best utilization of the furnace gas may be considered as an ideal batch weight.

As for the method of calculating the batch weight of coke, in foreign practice only one factor is commonly considered, i.e., the stack diameter. However, from the accumulated practical data, the author assumes that in addition to the stack diameter there are also many other factors, such as intensity of flowing, permeability of stock column, gas distribution and bulk density of charge materials, etc.

Based on the relationship between the above-mentioned factors and the batch weight of ore, an empirical formula is proposed for calculating the ideal ore batch weight as a reference for selecting and adjusting the charging batch in practical use. The calculated results proved to be in agreement with the practical operations under normal conditions.

AUTHOR: ZHANG Wenda [1728 2429 6671]
FENG Kaisheng [7458 7030 4141]
MENG Qingrui [1322 1987 3843]

ORG: All of the Ironmaking Works No 2, Benxi Iron and Steel Company

TITLE: "Intensive Blowing in a 2000 m^3 Blast Furnace"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 25-33

TEXT OF ENGLISH ABSTRACT: This paper has summed up the experiences in intensifying the smelting operation and lowering the coke ratio in a 2000 m^3 blast furnace. The measurement taken in improving the raw material preparation, optimizing the furnace control as well as strengthening the flushing and tapping operations, is commented on. By analyzing the operational data and the effect of different factors on intense blowing, further steps to be taken for intensification in furnace operation are discussed.

AUTHOR: DU Hegui [2629 7729 2710]
DU Gang [2629 6921]

ORG: Both of the Northeast Institute of Technology

TITLE: "A Study of Appropriate Thickness of Iron Ore and Coke Layers in Blast Furnace"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 34-42

TEXT OF ENGLISH ABSTRACT: By means of dimensional analysis and a series of model experiments, the authors of this paper studied aerodynamic conditions in softening melting zone in blast furnace. They have found the functions between permeability index ($\xi/\Delta H$) and thickness of coke silt (h), its voidage (ε), width (L) and numbers of cohesive zones (n). It was pointed out that the functional thickness played an important role in intensifying the smelting process and better utilization of gas energy in the blast furnace. Furthermore, proof of the importance of enlarged batches and improved quality of raw materials and fuels in actual practice is given.

According to the three model test with burden distribution in the throat of the blast furnace (central part with ore, ore just to the central part, central part without ore), the permeability coefficient is measured, and on the basis of configuration of burden distribution, the central and peripheral thickness of iron ore and coke

[Continuation of GANGTIE No 7, 1981 pp 34-42]

layers is calculated. In combination with the behavior of coke silt, the proper thickness of iron ore and coke layers in the blast furnace is proposed.

Through this investigation, it is pointed out that in order to obtain higher utilization of gas energy in the blast furnace, the reasonable curve of radial CO_2 distribution in the throat is neither of the "double peak type" nor of the "flat peak type," but of the "spreading wing type," i.e., high at both edges and low in the center.

AUTHOR: ZHANG Shourong [1728 1108 2837]

ORG: Wuhan Iron and Steel Company

TITLE: "Effect of Alkali and Maintenance of Proper Operating Profile of Blast Furnaces"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 43-49

TEXT OF ENGLISH ABSTRACT: This paper describes the occurrence of accretion in the No 3 blast furnace at Wuhan Iron and Steel Company, and discusses the cause of its formation. At Wuhan Iron and Steel Company, the sinter contains too much -5 mm fines (usually 15-20 percent), higher alkali ($K_2O + Na_2O$ about 0.4 percent, the total load about 7-8 kg/t iron), which brought about a lot of operating troubles for the blast furnace. In order to obtain a better performance of the blast furnace, it is necessary to maintain a proper operating profile of the blast furnace so that accretion can be avoided. To prevent the accumulation of alkali in the blast furnace, it is very important to increase the capacity for the removal of alkali. The blast furnace operation at Wuhan Iron and Steel Company proved that decreasing slag basicity (CaO/SiO_2) or replacing CaO with MgO is profitable for alkali removal as well as for smelting of low sulfur and low silicon iron. The cause for accretion is very complicated. Based on the characteristics of raw materials, finding a suitable operating method through trial runs is the key point in obtaining a better furnace performance. In the course of regulation, the problem of maintaining a suitable operating profile must be kept in mind.

AUTHOR: LI Make [2621 7456 0668]

ORG: Department of Iron and Steel, Ministry of Metallurgical Industry

TITLE: "The Control Technique of Upper and Lower Zones of the Blast Furnaces"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 50-55

TEXT OF ENGLISH ABSTRACT: For several years the control technique of the upper and lower zones of the blast furnace has made rapid progress. In the 70's, the operators of foreign blast furnaces also noticed the importance of controlling burden distribution, hearth temperature and blast technique. Without movable throat armor and a bell-less top, domestic blast furnaces, by adopting the method of separately charging the large charge, have a decrease of coke ratio of about 30 kg/t. A low silicon and low sulfur iron can be made by controlling the theoretical combustion temperature and blast adjustment, increasing the basicity of slag.

AUTHOR: QIAN Renyi [6929 0086 3015]
CHEN Xiaoquan [7115 1420 2938]

ORG: Both of the Research Institute of Shoudu Iron and Steel Company

TITLE: "Investigation and Practice of the Stock Distribution with the Bell-less Top"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 7, 1981 pp 56-61

TEXT OF ENGLISH ABSTRACT: An experimental test of distribution was carried out by using a 1:6 model bell-less top similar to that of the new No 2 blast furnace of Shoudu Iron and Steel Company. The profile of the layered burden materials prior to blowing-in of the furnace was measured and recorded. Parameters, such as the effective working range of the chute angles (α), the relationship between α and the falling points of charging materials and the size of opening of the material flow regulating valves for different batch weights of burden materials was closely examined. The functions and interrelations among the chute angles, height of stock lines, batch weights and material distribution at the different stock line levels are further understood.

During the first half year of operation of the new No 2 blast furnace in 1980, operation was smooth. By using a ring charging system, the analysis of blast furnace top gas gave a CO_2 content of 18.5 percent on the average, and the permeability of the stock ($V/\Delta P$) was around 2100.

[Continuation of GANGTIE No 7, 1981 pp 56-61]

Through this experiment we found that the diameter of the central pipe should be big enough to get rid of choking of burden materials and coordinating with the material flow gate openings rather than avoiding the segregation of the charging materials. The length of the rotating chute should be able to make full use of the effective working range at all chute angles.

AUTHOR: WANG Lihua [3769 7787 5478]

ORG: Wuhan Iron and Steel Design and Research Institute

TITLE: "Design for Improvement of the Structure of Internal Combustion Hot Stove"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: This paper deals with the weak points of the internal combustion hot stoves for the existing blast furnaces, and studies the ways to improve the structure of the internal combustion hot stoves for achieving a higher temperature and a longer service life. In comparison with the top combustion stoves or the external combustion stoves, the new 1300°C internal combustion stoves have the following advantages: simplicity of dome structure, minimum intergranular stress corrosion, less heat loss and superior stability in such structures as the dome, partition wall, combustion chamber and checker works. Furthermore, the new type of stoves can attain higher blast temperature and longer life and can also utilize the original facilities and structures. The cost for their reconstruction is also very low.

AUTHOR: PENG Huaguo [1756 5478 0948]

ORG: Chongqing Iron and Steel Design and Research Institute

TITLE: "Burden Descending and Aerodynamics Analysis in Shaft DR Furnace"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 7-12

TEXT OF ENGLISH ABSTRACT: This paper analyzes the characteristics of gas motion in several shaft DR furnaces and points out that, for shaft furnaces with cooling gas at a single cycle, a certain distance must be kept between the cooling gas outlet and the reducing gas inlet. The controlling parameter for the design of the cycling of cooling gas should be $|P_R-P_C| \leq hp \times 10\%$.

After proper revision, the pressure loss of bulk burden column in the shaft furnace may be considered a motion of static burden. Through further discussion of the pressure loss in the bulk burden column ΔP, it was concluded that the shaft furnace is a highly efficient equipment for ironmaking.

AUTHOR: ZHANG Zongcheng [1728 1350 6134]
SU Huihuang [5685 6540 3552]

ORG: Both of the Institute of Chemical Metallurgy, Chinese Academy of Sciences

TITLE: "Temperature Distribution in the Bottom of Blast Furnaces"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 13-18

TEXT OF ENGLISH ABSTRACT: This paper presents an effective method of evaluating the temperature distribution and heat flow in the bottom of the blast furnace. It would be helpful in designing furnaces and selecting lining materials. Because of the penetration of liquid iron, thermal conductivity of the lining in the salamander space changes. As a result, the solidifying line (which is assumed to be 1150°C) moves downward. The possible space and limiting location of the 1150°C isotherm are determined by using iterative techniques, and the finite element method is used to solve the two-dimensional steady-state heat conduction equation.

The temperature distributions in some typical bottoms with different linings have been calculated. Based on computed results, the all-carbon brick hearth with under hearth cooling would have less salamander penetration and would be the better desige for the bottoms of large modern blast furnaces.

AUTHOR: WANG Yiren [3769 0001 0088]
LI Xiangan [2621 6343 3227]

ORG: Both of Shanghai University of Communications

TITLE: "Study of Simulation of Channel-type Countercurrent Continuous Steelmaking"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 19-25

TEXT OF ENGLISH ABSTRACT: This article describes a small-scale experimental study of continuous steelmaking in a channel-type countercurrent furnace. The metal flow rate used was 600 kg/hr. A cored induction furnace was provided to keep the molten iron hot before it entered the channel furnace, and a line frequency coreless induction furnace with a short inductor was used to adjust the composition and temperature of the steel produced. During the experiment, samples of metal and slag were periodically taken at various points along the length of the channel for chemical analysis, and the temperatures were measured to find the temperature variation. Based on the test results, oxygen transfer in the furnace and the dephosphorization and desulfurization of the metal were analyzed. The average dephosphorization was 96 percent and the average desulfurization 60 percent. The influence of backflow in the furnace on the end phosphorus and sulfur content was discussed. The main advantages of this type of process are: simple equipment, safe operation, small flux consumption (1/2 to 2/3 of that in the LD process), high refining efficiency, and less dust emission. Scaling up into pilot plant tests

[Continuation of GANGTIE No 8, 1981 pp 19-25]

is necessary for a more comprehensive investigation of engineering and economical aspects of the process.

AUTHOR: SHEN Ruzhang [3088 1172 3864]
SHEN Bide [3088 1764 1795]
LIN Youzuo [2651 2589 4373]
XIANG Deyuan [0686 1795 3220]
YE Chongfa [5509 1504 4099]
LI Shuchuang [2621 6615 0[illegible]82]
et al.

ORG: SHEN Ruzhang, SHEN Bide and LIN, et al., all of the Shanghai Steel Works No 1; XIANG, YE and LI, et al., all of the Central Iron and Steel Research Institute

TITLE: "Study of Controlled Rolling of Nb-bearing Low Carbon Steel Plates"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 26-34

TEXT OF ENGLISH ABSTRACT: Through laboratory tests and industrial experiments with 2-high and 4-high plate mills, the production process for controlled rolling of 09MnNb steel plates and its appropriate chemical composition were established. The controlled rolled 09MnNb steel plates produced by the addition of low grade ferroniobium have high strength and high toughness. A yield strength of up to 10 kg/mm^2 higher than that of the ordinary 09MnNb steel has been observed. This kind of steel plate can be used for shipbuilding and truck chassis. It has an advantage over other steel plates of the same grade in simplicity of production and low cost.

AUTHOR: SU Fengxi [5685 6646 6007]
LIANG Guoping [2733 0948 1627]

ORG: SU of the Beijing University of Iron and Steel Technology; LIANG of the Institute of Mathematics, Chinese Academy of Sciences; Group of Mathematical Models, Shanghai Steel Works No 10

TITLE: "The Cold Rolling Force Model Taking Account of the Effect of Inhomogeneous Deformation"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 35-40

TEXT OF ENGLISH ABSTRACT: It has been shown by the test that macroscopic inhomogeneous draft may occur in the cold rolling of strips if the parameter $\ell'/\bar{h}$ is less than a certain value. The coefficient n_δ given by the theory of homogeneous deformation does not seem proper and should be modified by an amount of $\Delta n_\delta \propto (\ell'/\bar{h})^{-1}$.

The statistical model of n_δ, which takes into account inhomogeneous deformation, given in this work is not only proper for cold rolling strips, but also for hot rolling sheets and plate rolling.

AUTHOR: ZHU Jing [2612 7234]
ZHAO Yingwei [6392 3841 0251]
PAN Tianxi [3382 1131 0823]
et al.

ORG: All of the Central Iron and Steel Research Institute

TITLE: "Investigation on Reverse Austenite in 18Ni(250 grade) Maraging Steel"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 41-45

TEXT OF ENGLISH ABSTRACT: The formation of reverse austenite in 18Ni (250 grade) maraging steel was studied with transmission electron microscopy. The distribution, morphology, amount of reverse austenite under different maraging regimes and its effect on properties were determined and discussed. An optimum regime of heat treatment for deep drawing is proposed.

AUTHOR: CHAI Shousen [2693 1108 2773]
GE Yunlong [5514 0061 7893]

ORG: Both of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "The Influence of Trace Element Mg on Hot Workability of Low-temperature Steel 15Mn26Al4"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 46-51

TEXT OF ENGLISH ABSTRACT: The influence of trace element Mg on hot workability of low-temperature steel 15Mn26Al4 has been studied. With the help of fracture observation by SEM and identification by ion probe, it has been found that the trace of Mg, which comes from the reduction of magnesia lining by Al in liquid steel or a small addition of Mg on purpose, is concentrated on the grain boundary as a form of segregative layer or eutectic film with low-melting point. It is melted locally with an increase of temperature, and the strength of the grain boundary is reduced. The conclusion can be drawn from the above results that the concentration of Mg on the grain boundary caused the intergranular brittle fracture and rolling failure.

AUTHOR: GU Deji [7357 1795 7535]
QIN Yongxi [4440 3057 6932]
GAO Yongqing [7559 3057 3237]
et al.

ORG: All of the Shanghai Iron and Steel Research Institute

TITLE: "The Injection Reduction Dephosphorization Process (IRD) for HIHG Alloy Steel and Its Industrial Application"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 8, 1981 pp 52-56

TEXT OF ENGLISH ABSTRACT: The powder injection under reducing atmosphere would efficiently dephosphorize the molten steel with high chromium content (over 13 percent) without oxidation.

Through industrial experiments with 5 ton and 15 ton melts, it has been proved that IRD is a successful process for making stainless steel with high phosphorus scrap returns.

The basic principles of dephosphorization under reducing atmosphere are discussed. Under such conditions calcium reacts with phosphorus and produces calcium phosphide: $3(Ca)^{+} + 2(P)^{-} \rightarrow (Ca_3P_2)$. It is considered that IRD is a good method for improving the steel quality in industrial production.

9717
CSO: 4009/497

AUTHOR: XU Xiuyin [1776 4423 5593]
GE Chuanzhen [5504 0278 3791]
FENG Duan [7458 4551]

ORG: All of Nanjing University

TITLE: "A Study of Dislocations and Inclusions in Yttrium Aluminum Garnet Crystals with Birefringence Topography"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 1-4

TEXT OF ENGLISH ABSTRACT: Birefringence images due to dislocations and inclusions in YAG crystals were studied with polarizing microscopy. Birefringence images of dislocations viewed end-on as well as viewed from the side were interpreted by Tanner and Fathers' theory with due consideration of the effect of long-range strain field. The Burgers' vectors of dislocations were found to be of the type of $\frac{1}{2}\langle 111\rangle$, $\langle 100\rangle$ and $\langle 110\rangle$. The effect of long-range strain field on birefringence images was elucidated.

AUTHOR: QIU Dirong [8002 4574 2837]
FAN Depei [5400 1779 1014]
ZHANG Jianzhong [1728 1696 0022]

ORG: All of Nanjing University

TITLE: "On the Morphology and Annealing Behavior of Swirl Defects in Czochralski-grown Silicon"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 9-16

TEXT OF ENGLISH ABSTRACT: Swirl defects in as-grown CZ silicon which has not experienced any heat treatment can be directly detected by preferential etching. The shape and the distribution of the etch pits are found to be similar to those in FZ silicon, but some differences still existed. Dislocations can suppress the formation of swirl defects, but have no apparent influence on the growth striations.

It is found that the swirl patterns can be eliminated by annealing the silicon wafers at temperatures of 1150°C and 1180°C for 1.5 to 2 hours in a nitrogen atmosphere, and therefore it is not valid that the swirl defects can be eliminated only by diffusion of carbon or oxygen atoms.

A discussion is given of the problem of heat treatment changing the as-grown state of crystals and affecting the reality of detecting swirl defects.

AUTHOR: WANG Wenshan [3769 2429 1472]
ZOU Qun [6760 5028]
GENG Zhaohua [5105 0340 5478]

ORG: All of Nanjing University

TITLE: "The Cracking of $KNbO_3$ Crystals during Czochralski Growth and Its Prevention"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 17-26

TEXT OF ENGLISH ABSTRACT: $KNbO_3$ crystals are easily cracked during preparation and processing. This paper studies prevention of cracks during Czochralski growth and cooling of $KNbO_3$ single crystals. It was roughly calculated that maximum acceptable temperature gradient is $(dT/dZ)_{max} \leqslant 20°C\ cm^{-1}$ and maximum rate of cooling is $(dT/dt)_{max} \leqslant 50°C\ hr^{-1}$ for a crystal with a radius $R = 1.5$ cm. For cooling from 500°C it was found experimentally that the maximum satisfactory rate is about $10°C\ hr^{-1}$ (i.e., less than theoretical value). Under normal growth conditions, the maximum resultant strain is $\varepsilon^c max = 5 \times 10^{-5}$ for a crystal with a radius $R = 1.5$ cm, and the maximum axial gradient is about $10°C\ cm^{-1}$ under suitable conditions. With 52-53 mol percent K_2CO_3 content, high quality $KNbO_3$ single crystals up to $30 \times 30 \times 15\ mm^3$ in size have been grown in our laboratory.

AUTHOR: HAN Shiying [7281 0013 3853]

ORG: Nanjing University

TITLE: "Measurement of Spin Wave Linewidth"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 27-32

TEXT OF ENGLISH ABSTRACT: In this paper the instrumentation and techniques which are suitable for measuring first-order instability threshold values of microwave field for both configurations, perpendicular and parallel pumps, in magnetic order materials are described. The spin wave linewidth is derived from instability threshold values for parallel pumps. Experimental results are given for a sphere of yttrium iron garnet at room temperature and X-band. These results are in good agreement with those obtained by other research workers.

AUTHOR: LU Mu [7773 3668]
LIU Jizhe [0491 1376 3181]
WANG Zijun [3769 5261 6874]
et al.

ORG: All of Nanjing University

TITLE: "Effect of Ru^{3+} Doped $PbFe_{12}O_{19}$ Single Crystals on Anisotropy"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 33-38

TEXT OF ENGLISH ABSTRACT: The anisotropy of $PbFe_{12}O_{19}$ crystals doped with different amounts of Ru^{3+} ions was studied. Uniaxial anisotropic constant K_1 steeply increases with Ru^{3+} content for small incorporation, passes through a maximum and then decreases gradually as Ru^{3+} content increases further. The peak value of $\Delta K/K$ amounts to 27 percent at room temperature. The phenomenon can be qualitatively interpreted by competing effect of Ru^{3+} ions in two different octahedral sublattices.

AUTHOR: XU You [1776 3266]
YANG Guilin [2799 2710 2651]
ZHAI Hongru [5049 1347 1172]

ORG: All of Nanjing University

TITLE: "Calculation of the Zero Field Splitting Constant D of Ion Fe^{3+} in a Trigonal Crystal Field"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 39-46

TEXT OF ENGLISH ABSTRACT: The zero field splitting constant D of Fe^{3+} ion in α-Al_2O_3 matrix has been calculated by perturbation theory to the second order in spin-orbital coupling. Starting from the ground state ^6S of a free Fe^{3+} ion with electron configuration $3d^5$, and adopting the spin-orbital coupling constant obtained using Watson's Junction, we arrived at a value of D in good agreement with measurement.

AUTHOR: ZHENG Youdou [6774 2589 3499/2435]
JIANG Ruolian [3068 5387 8834]

ORG: Both of Nanjing University

TITLE: "Investigation of Thermally Stimulated Ionic Current Spectra in MOS Structures"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 47-56

TEXT OF ENGLISH ABSTRACT: In this paper, we present our results of study of TSIC (thermally stimulated ionic current) spectra in MOS structures. It is observed that a new ion current peak which appears in wet oxygen and HCl oxidized samples may be due to hydrogen ions. The properties of TSIC spectra have been investigated and the results indicate that TSIC spectra depend strongly not only on the polarity and strength of the applied field, but also on the structure and impurity in SiO_2/Si interface.

AUTHOR: GAO Wenqi [7559 2429 3823]
YE Quanshu [5509 2938 2579]

ORG: Both of Nanjing University

TITLE: "Application of Some Properties of Fourier Transform in Computer-generated Holograms"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 57-66

TEXT OF ENGLISH ABSTRACT: In order to improve the image's quality of computer-generated holograms, some data processing methods by using properties of Fourier Transform are described.

AUTHOR: TENG Chengsong [7506 6134 2646]
YI Ming [2496 2494]

ORG: Both of Nanjing University

TITLE: "The Use of Merit Function Based on Walsh-MTF Function in Automatic Lens Design"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 67-70

TEXT OF ENGLISH ABSTRACT: The merit function based on Walsh-MTF function is applied to the automatic design of optical systems. It is used in the final stages of the optimization of well-corrected systems.

AUTHOR: YANG Xuanmin [2799 6693 3046]
CHEN Yongqiang [7115 3057 1738]
YI Ming [2496 2494]
et al.

ORG: All of Nanjing University

TITLE: "Investigation and Measurement of Vibration with the Integrated-Heterodyne-Doppler Optical Beats Effect"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 71-78

TEXT OF ENGLISH ABSTRACT: If a vibrating surface is illuminated with a laser beam whose light frequency is shifted slightly from fo to $fo \pm f_D$, f_D is known as Doppler shift $f_D = fo \frac{V}{C}$. When $V = VoCos\Omega t$, the light frequency is said to have frequency modulation. If another light beam is used whose frequency is $fo + f_A$ (f_A is the ultrasonic frequency obtained with an acoustic optical device), then the difference frequency-optical beats can be obtained with a detector after passing through the discriminator and integrator, resulting in the displacement amplitude of vibration results. The advantage of using the heterodyne method is that the various noises can be avoided.

AUTHOR: XU Chengwen [1776 2110 2429]
WANG Zhiying [3769 5347 5391]
XI Dexun [1598 1795 0534]
et al.

ORG: All of Nanjing University

TITLE: "The A/D Conversion Technique and Method of Function Generation with MB 8861 Microprocessor"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 79-95

TEXT OF ENGLISH ABSTRACT: The newly-designed multifunctional function generator and eight-bit successive approximation ADC built around the MB 8861 microprocessor has been investigated using a few additional inexpensive analog components. Function generaotr may provide such functions as pulse triangle, Walsh function and binary maximum length sequence. ADC has better linearity and stability and its time for performing an eight-bit conversion is ~500μs.

AUTHOR: FENG Wenquan [7458 2429 4019]
CHEN Zhenhua [7115 2182 5478]
BAO Dianpu [7637 0368 3877]

ORG: All of Nanjing University

TITLE: "The Experimental Methods for the Deqing Circuit"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 96-104

TEXT OF ENGLISH ABSTRACT: In this paper we present the experimental methods for the Deqing circuit, which is widely applied to the high power line-type modulator. The points included are as follows:
(1) whether waveform monitoring for detecting the circuit is in order;
(2) circuit regulation;
(3) necessary experiments for getting the design specifications of pulse amplitude stability;
(4) a method for improving the amplitude stability, and
(5) methods for measuring amplitude drift between pulses.

AUTHOR: SHEN Dexun [3088 1795 0534]
YANG Congjun [2799 1783 5028]

ORG: Both of Nanjing University

TITLE: "Ionization Chamber for 20 Mev Medicine Accelerator E and X Ray Dose Monitoring"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 105-111

TEXT OF ENGLISH ABSTRACT: A parallel-plate ionization chamber and coaxial ionization chamber having thin wall electrodes which is suitable for monitoring or for dose measurements are described. The electron energy varies from 8 Mev to 20 Mev. 1 rad/min < dose rate < 10,000 rad/min ionization current is proportional to electron beam fluence for a fixed beam energy, while a dose rate of 8 r/min (x beam) ionization chamber produces ionization current 10^{-9} A.

AUTHOR: YU Chongzhi [0151 1504 2535]
WU Yukui [0702 3768 1145]
HUA Yiman [5478 0001 3341]
HU Chunnian [5170 2504 1628]

ORG: All of Nanjing University

TITLE: "Speech Signal Processing System Consists of DJS-131 Computer"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 112-121

TEXT OF ENGLISH ABSTRACT: A speech signal processing system is introduced in this paper. It consists of a DJS-131 computer, A/D and D/A converter, etc. This system can be used for research on speech analysis, speech synthesis, speech recognition and extraction of speech in noise.

AUTHOR: YING Zhaomin [2019 2507 2404]
QIN Zhenghao [4440 2973 3185]

ORG: Both of Nanjing University

TITLE: "A Tracing System of Microwave Resonant Frequency for Measuring Average Densities of Cryogenic Liquids"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 122-134

TEXT OF ENGLISH ABSTRACT: We have made a set of devices employed for automatic and continuous measuring of resonant frequency which measure the density of some cryogenic liquid, such as liquid nitrogen, hydrogen, etc., and also the other physical parameters of non-polar liquids, such as dielectrical constants, average polarizabilities and radii of molecules, etc., while equipped with an open-ended microwave cavity.

AUTHOR: SHUI Yongan [3055 3057 1344]
JIANG Wenhua [1203 2429 5478]
WU Wenqiu [0702 2429 5876]
et al.

ORG: All of Nanjing University

TITLE: "The Surface Acoustic Wave Diffraction Effect on 127.86° Y-rotated Lithium Niobate"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 135-146

TEXT OF ENGLISH ABSTRACT: The surface acoustic wave velocity distribution and the anisotropic factor on 127.86° Y-rotated lithium niobate are calculated. Using the scalar diffraction theory and the parabola approximation with this anisotropic factor we have calculated the diffraction losses. The diffraction losses are also measured experimentally by comparing the insertion losses of filters with different apertures and different distances between transducers. The theoretical and experimental results are compared.

AUTHOR: YU Zurong [0060 4371 2837]

ORG: Nanjing University

TITLE: "The Resonating Group Model of Baryons"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 147-150

TEXT OF ENGLISH ABSTRACT: In this paper we propose a model called the resonating group model for baryon. Using the theoretical formula of the nucleon magnetic moment ratio $\mu p/\mu n$ and the weak coupling constant ratio G_A/Gv given by the model, we analyze the experimental data and then show that this model is suitable for discussion of the baryon spectrum and that the non-central force in the qq interaction is very important.

AUTHOR: WU Rulin [0702 3067 7792]
HE Yuliang [0149 1342 0081]
SHAO Da [6730 6671]

ORG: All of Nanjing University

TITLE: "A New Method to Prepare Amorphous Silicon Films"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 151-153

TEXT OF ENGLISH ABSTRACT: In this paper we present a new method to prepare amorphous silicon films by r.f. glow discharge in the SiH_4 and HF gaseous mixture system. In this system the gases under ionic collisions are decomposed and then a Si:F:H film is deposited. Since the Si-F bonds are much stronger than the bonds of Si-H, the new type of amorphous silicon films is more stable and heat resistant then are the hydrogenated amorphous silicon films.

AUTHOR: XU Jianjian [1776 0256 0256]
YAN Jialie [7346 1367 3525]
SHAO Huimin [6730 1920 3046]

ORG: All of Nanjing University

TITLE: "An Instrument for Measuring AC Losses of Superconductors"

SOURCE: Nanjing NANJING DAXUE XUEBAO WULIXUE ZHUANKAN [JOURNAL OF NANJING UNIVERSITY (SPECIAL PHYSICS ISSUE)] in Chinese 1980 pp 154-158

TEXT OF ENGLISH ABSTRACT: For some years we have been developing an instrument for measuring AC losses of superconductors. This article is mainly a report of experiments on low temperatures made with this instrument. The results show that this instrument is up to the design requirements, and at the same time is suitable and reliable.

9717
CSO: 4009/482

Physics

AUTHOR: HU Ning [5170 1380]
ZHANG Dehai [4545 1795 3189]
DING Haogang [0002 3185 0474]

ORG: All of Beijing University

TITLE: "The Radiation Damping on Binary Stars Due to Emission of Gravitational Waves"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1003-1010

TEXT OF ENGLISH ABSTRACT: According to the general theory of relativity, force is not a covariant quantity under general coordinate transformations. Different coordinate conditions will lead to different damping forces. It will be convenient to find out the physical coordinate system in which the calculated value of the damping effect is the same as or nearest to that observed on earth. We expect that this physical coordinate system should be free from spurious non-transverse gravitational waves at infinity. In these coordinates the change of orbital period P due to emission of gravitational waves is given by

$$\dot{P} = -6.5 \times 10^{-12} \frac{m_1 m_2}{M_\odot^2} \left(\frac{m_1 + m_2}{m_\odot} \right)^{-1/3} .$$

AUTHOR: CHEN Renshu [7115 0088 6615]
XIMEN Jiye [6007 7024 4764 2814]

ORG: Both of the Department of Radioelectronics, Beijing University

TITLE: "The Second Order Trajectories and Transfer Formulas in Crossed Toroidal Electric and Inhomogeneous Magnetic Fields"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1011-1019

TEXT OF ENGLISH ABSTRACT: The second order ion trajectories in crossed toroidal electric and inhomogeneous magnetic fields are derived by means of Fermat's principle and expressed in energy deviation. The ion trajectory formulas may be transferred into velocity or momentum deviation. The transfer formulas between different deviations are given in detail.

AUTHOR: ZHANG Yangzhong [4545 2254 1813]

ORG: Southwestern Institute of Physics, China

TITLE: "The Coherent Renormalization Theory of Collisionless Plasma"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1020-1029

TEXT OF ENGLISH ABSTRACT: A renormalization procedure for the perturbative manipulation of Vlasov-Poisson equation has been proposed in this paper. By the graphical expansion method the theory is shown to be renormalizable to any order, and the renormalized propagator is given. The physical meaning of the coherent terms and the absolute incoherent terms are analyzed. The correct expression for the renormalized dielectric function is given and its significance is discussed. By comparison with previous renormalization theory, it is pointed out that this procedure is a true complete renormalization.

AUTHOR: PENG Huanwu [1756 2719 2976]

ORG: Institute of Theoretical Physics, Chinese Academy of Sciences

TITLE: "An Attempt at a Fluid Structure of the Electron in Space with Five Dimensions"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1030-1040

TEXT OF ENGLISH ABSTRACT: The four-dimensional space-time of special relativity is augmented with a fifth dimension to take into account the gauge transformation of the electromagnetic potentials. In doing this, a new field is introduced purely from dimensional consideration. It will be shown in this paper that this field plays an especially important role inside the electron. It gives rise naturally to the Poincare stress needed for maintaining dynamical equilibrium within an extensive electron, and also reflects the dielectric constant and permeability of the medium within. It thus appears feasible to adopt a fluid structure for the extensive electron, and stable solution for the motion of the fluid particles has been obtained in general. The electrodynamics within the electron have also been obtained, and no physical solution with spherical symmetry exists. Axially symmetrical solution probably exists, which will be discussed in a subsequent paper.

AUTHOR: GAN Zizhao [3927 1311 6856]
YANG Guozhen [2799 0948 2823]

ORG: GAN of the Department of Physics, Beijing University; YANG of the Institute of Physics, Chinese Academy of Sciences

TITLE: "A Theory of Coherent Propagation of Light Waves in Semiconductors (II)"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1041-1055

TEXT OF ENGLISH ABSTRACT: This paper is the second part of a theory of the coherent propagation of light waves in semiconductors. After considering the interaction between electrons, the problem of a semiconductor interacting with light is discussed and the equation of exciton polarization wave excited by light waves is obtained. We point out that the equation can be approximated by a set of linear ones and the exciton polarization wave can be regarded as a Bose filed only in the limit of low excitation. In this paper, the problem of coherent excitation of discrete exciton level system excited coherently is approximately equivalent to a two-level atom system excited by light waves in which the difference of energy level is dependent on the degree of excitation and the density of equivalent "two-level atoms" is determined by features of the exciton state wave function.

AUTHOR: GAN Zizhao [3927 1311 6856]
YANG Guozhen [2799 0948 2823]

ORG: GAN of the Department of Physics, Beijing University; YANG of the Institute of Physics, Chinese Academy of Sciences

TITLE: "A Theory of Coherent Propagation of Light Waves in Semiconductors (III)"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1056-1066

TEXT OF ENGLISH ABSTRACT: This paper is the third part of a theory of the coherent propagation of light in semiconductors. Based on the previous papers, the Maxwell-Bloch equation describing the coherent propagation of light in semiconductors is derived; the equation is then used to discuss a number of possible effects of coherent propagation in both interband transitions and exciton transitions. In particular, the phenomena of self-induced transparency are analyzed, and it is shown that the phenomena may occur in the above two transitions.

AUTHOR: PAN Shaohua [3382 1421 5478]

ORG: Institute of Physics, Chinese Academy of Sciences

TITLE: "A Semiclassical Theory of Mode Coupling in Dye Lasers"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1067-1076

TEXT OF ENGLISH ABSTRACT: The semiclassical laser theory proposed by Lamb for a two-level system is extended to the case of dye lasers. Mode coupling equations are deduced, and a discussion is given.

AUTHOR: XU Zhizhan [1776 5267 1455]
LI Anmin [2621 1344 3046]
CHEN Shisheng [7115 2514 0524]
et al.

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Investigation of Laser Heating of Plasmas"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1077-1084

TEXT OF ENGLISH ABSTRACT: We have studied the interaction between the 10^{10} W Nd glass laser pulses with a leading edge of about 1 ns and several planar targets made of deuterium-containing materials. In our experiments, the neutron yields, electron temperature and various characteristics, such as reflectivity, temporal, spatial and spectral structure, of the backward-reflected laser light from the plasmas have been measured.

AUTHOR: SHEN Hongyuan [3088 7703 0337]

ORG: Fujian Institute of the Structure of Matter, Chinese Academy of Sciences

TITLE: "Thermal Effects in Orthorhombic YAP Crystals"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1085-1099

TEXT OF ENGLISH ABSTRACT: The thermal effects arising from the lasing process in orthorhombic YAP crystals have been discussed theoretically in this paper. Mathematical expressions have been given for the thermal distribution, stress-strain distribution, birefringence and thermal lens effect of the YAP crystals as well as the isogyre pattern of a YAP rod placed between crossed polarizers. It is shown that calculated results agree qualitatively with the observed thermal effects.

AUTHOR: SHI Zhongjian [2457 0112 1017]
YING Chongfu [2019 1504 4395]

ORG: Both of the Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Spiral Crystals"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1100-1105

TEXT OF ENGLISH ABSTRACT: The object of this article is to present the experimental facts about the spiral crystals. The spiral crystal is just like a straight crystal bar with definite orientation coiled on a cylindrical surface. It is not formed spontaneously, but is formed under control. Some problems of spiral crystals are discussed.

AUTHOR: MAI Zhenhong [7796 2182 3163]
GE Peiwen [5504 1014 2429]
CUI Shufan [1508 2885 5400]
WU Lansheng [0702 5695 3932]

ORG: All of the Institute of Physics, Chinese Academy of Sciences

TITLE: "The Observation of Defects in Synthetic Quartz by X-ray Topography"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1106-1110

TEXT OF ENGLISH ABSTRACT: The grown-in defects in a synthetic quartz crystal grown from a Z-cut seed plate have been surveyed by X-ray topography and ion probe method. In addition to usual dislocations, it has also been found that some rare fault surfaces exist which have not been reported so far. The configuration, fault vector and formation of the fault surfaces are discussed.

AUTHOR: ZHANG Pengxiang [1728 7720 5046]
MO Yujun [5459 5148 0193]

ORG: Both of the Institute of Physics, Chinese Academy of Sciences

TITLE: "Possible Origin of the FMR Linewidth Anisotropies in YIG and BCVIG Single Crystals"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1111-1116

TEXT OF ENGLISH ABSTRACT: We propose a possible origin of FMR linewidth anisotropy shown in mechanically polished YIG and BCVIG single crystals. The stresses left on the surface of the spheres of these crystals couple with the magnetization through the magnetostriction effect, and thus give rise to an additional linewidth, which is anisotropic due to the anisotropic magnetostrictive constant. Supposing that the damaged layer is mainly composed of high density dislocations, a relation between the FMR linewidth anisotropy and the magnetostriction constants is deduced based on micromagnetism theory and the two-magnon scattering process. From the measured linewidth anisotropy of YIG, we evaluated the dislocation density of the surface layer to be $5.4 \times 10^{10}/cm^2$.

This relaxation process shows that in order to further reduce the linewidth of an ultra-low linewidth polycrystalline material, suppressing the magnetostriction constant may play an important role.

AUTHOR: ZHANG Kaiming [1728 7030 2494]
YE Ling [5509 0109]

ORG: Both of the Institute of Modern Physics, Fudan University

TITLE: "The Chemisorption of Cl on the GaAs(110) Surface"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1117-1121

TEXT OF ENGLISH ABSTRACT: There are two problems involved in the Cl chemisorption on the GaAs (110) surface. One is whether Cl is absorbed on the relaxed surface or on the unrelaxed one, while the other is whether Cl is bonded with the surface anion or with the cation. The present work indicates that the Cl atom absorbs on the relaxed GaAs (110) surface and is bonded with the surface As. The density of states calculated from this configuration seems to agree well with existing experimental results.

AUTHOR: ZHANG Liyuan [4545 4539 3293]

ORG: Department of Physics, Beijing University

TITLE: "Green's Function Method for Energy Band Calculations in the Scalar Relativistic Approximation (SRA-KKR)"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1122-1126

TEXT OF ENGLISH ABSTRACT: In this paper, a Scalar Relativistic Green's Function method (SRA-KKR) neglecting the spin-orbit coupling effect has been proposed for the energy band calculation. With this method, only a few modifications to the Non-relativistic Green's Function method would be needed in order to obtain the relativistic effect on the electronic band structure of solids.

AUTHOR: LEI Xiaolin [7191 0876 7207]

ORG: Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "Sensitivity of the Radius of Convergence of the Series for Superconducting T_c to the High-frequency Behaviors of Phonon Spectral Function"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1127-1131

TEXT OF ENGLISH ABSTRACT: Based on a recent discussion on the analytical properties of the first order equation for T_c, we show, by concrete examples, that the radius of convergence of the series for superconducting critical temperature is so sensitive to the high-frequency behaviors of the phonon spectral function that it is inadequate for serving as a critical quantity in the criterion for dividing superconductors into type A and type B.

AUTHOR: WU Hangsheng [0702 2635 3932]
GU Yiming [7357 0001 7686]

ORG: Both of the University of Science and Technology of China

TITLE: "Note on the Convergence Properties of the T_c Series Solution"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 7, 1981 pp 1132-1136

TEXT OF ENGLISH ABSTRACT: The analysis of the present paper shows that in the case of $|\bar{z}_{ph}| < \min(|\bar{z}|, 1)$, the T_c series solution, although it does not converge outside the convergence circle determined by the singular point $\bar{z}_{ph}$, is an asymptotic power series so long as $1/\lambda$ is less than $[0.63 + 3\mu^+(1/\Lambda_1)]1/\Lambda_1$, where $1/\Lambda_1 = \min(|\bar{z}|, 1)$; $\mu^+(x) = (1-2\mu^* x)\mu^*$.

AUTHOR: WU Hangsheng [0702 2635 3932]
GU Yiming [7357 0001 7686]
MAO Deqiang [5403 1795 1730]

ORG: All of the University of Science and Technology of China

TITLE: "An Analytic Derivation for the McMillan T_c Formula (II) Case of $\mu^* \neq 0$"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1137-1140

TEXT OF ENGLISH ABSTRACT: In the present paper the theory and the T_c formula which were presented in the previous paper of this series are extended to the case of $\mu^* \neq 0$. The result obtained by the authors is as follows:

$$T_c = \frac{2\gamma}{\pi}\,\omega_{\log}\cdot\left(\frac{\omega_{\log}}{\omega_c}\right)^{\mu^*/(\lambda-\mu^*)}\cdot\exp\left\{-\frac{1+\lambda}{\lambda-\mu^*}\right\}.$$

Inγ = C = 0.5772 is the Euler constant.

AUTHOR: HAN Fusen [7281 4395 2773]
ZHENG Qitai [6774 0796 3141]
FAN Haifu [5400 3189 4395]

ORG: All of the Chinese Academy of Sciences

TITLE: "Crystal Structure of Picriafeltarragenin Epoxy Compound"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1141-1149

TEXT OF ENGLISH ABSTRACT: Single crystals of picriafeltarragenin epoxy compound, $C_{30}H_{44}O_6$, belong to space group $P2_12_12_1$ with lattice parameters a = 28.373 (9) Å, b = 10.667 (5) Å, c = 9.115 (4) Å, with four molecules in the unit cell. The intensities of 2890 independent reflections are collected using the PW-1100 four-circle diffractometer. The structure was solved with MULTAN 78 program and refined to a final R = 0.084 by block diagonal least square method. Positions of all the hydrogen atoms were obtained from the difference Fourier synthesis. The shortest distance between two molecules is 3.5 Å.

AUTHOR: ZHANG Yuanzhong [1728 0337 0112]
LIU Yufen [0491 3558 1164]

ORG: Both of the Institute of Theoretical Physics, Chinese Academy of Sciences

TITLE: "The Spherically Symmetric and Static Solutions in the $L \otimes U(1)$ Gauge Theory of Gravitation"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 30 No 8, 1981 pp 1150-1154

TEXT OF ENGLISH ABSTRACT: It is more difficult to find an exact solution of the field equations in the gauge theory of gravitation as compared with finding that in Einstein's theory. As far as some problems in physics are concerned, however, it is sufficient to obtain a Newtonian approximate solution and a post-Newtonian approximate solution. In this note the $L \otimes U(1)$ gauge theory of gravitation is discussed. A special exact solution and the approximation to first order to the spherically symmetric and static field of a charged mass point are obtained.

9717
CSO: 4009/489

AUTHOR: RUI Hongnian [5360 1347 1628]
LI Shugui [2621 2885 6311]

ORG: None

TITLE: "Measures To Stabilize Pole-lines in Marshes and Stream Outlets"

SOURCE: Beijing DIANXIN JISHU [TELECOMMUNICATION TECHNOLOGY] in Chinese No 8, 10 Aug 81 pp 12-13

ABSTRACT: In the past, protective devices, such as braces, pull lines, stone cages, transverse rods, etc. were used to stabilize power-line poles when they ran through marshes or close to streams. In the freezing and thawing process, poles set in these places will gradually rise to topple over eventually. Based upon the method of constructing bridges by the military, the authors designed a new method of stabilizing these poles. Since its introduction in 1970, a total of 1100 poles have been set in marshes and river banks and there have been no problems at all. The special procedure of operating the pile hammer to insure the pole to be solidly planted and to prevent it from rising with changes of the ground condition is explained. Various work parameters are given, including the cost of the required pile hammer.

AUTHOR: MAO Minghao [3029 2429 3185]

ORG: None

TITLE: "Several Problems of Installation Design for the HJ-905 Machine"

SOURCE: Beijing DIANXIN JISHU [TELECOMMUNICATION TECHNOLOGY] in Chinese No 8, 10 Aug 81 pp 14-16

ABSTRACT: The HJ-905 exchange is now being widely used. Some customers have brought up some problems concerning its installation, however. Those problems are related to the selection of capacity, construction requirements of plant where the exchange is to be located, the installation procedure, and the power supply equipment for the exchange. Special properties of the exchange are explained in the process of delineating the solutions to these problems.

6168
CSO: 4009/23

END

JPRS 79343

2 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 134

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79343

2 November 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 134

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Chinese Divers Set World Record
(Ling Zhicum; HAIYANG, 15 Aug 81) 1

ABSTRACTS

ARCHITECTURE

JIANZHU XUEBAO [ARCHITECTURAL JOURNAL], No 8, 1981 3

COAL EXTRACTION

MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY], No 2, 1981 7

COMPUTER SCIENCE

SUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS], No 3, 1981 8

ENGINEERING

XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY], Nov 4, Aug 81 14

METALLURGY

JINSHU XUEBAO [ACTA METALLURGICA SINICA], No 4, Aug 81 20

SCIENTIFIC INSTRUMENTS

YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT], No 3, 1981 31

TEXTILE RESEARCH

FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH], No 4, 1981 37

CHINESE DIVERS SET WORLD RECORD

Beijing HAIYANG [OCEANS] in Chinese No 8, 15 Aug 81 p 23

[Article by Ling Zhicun [0407 1807 1317]: "Chinese Divers Set Anoghter World Record"]

[Text] The gate on the Boeing 727 swung open and we were greeted by the pleasant and refreshing breezes from the sea. Stepping onto the ground at the Nice International Airport, we couldn't help feeling cheerful and relaxed. As we bathed in the warmth of the sun and flew along the ocean drive in a milky white sedan, the delightful feeling is hard to describe. Looking around, we saw trees and flowering shrubs beneath the white clouds in the sky and reef rocks and seagulls above the green waves of the ocean. Around the harbor, buildings are gracefully laid out and, in the background, rugged cliffs rise abruptly, making the famous Nice harbor of south France--a Tourist's dreamland--ever so spectacular and attractive. However, we did not come here looking for the wonderful enjoyment. Instead, at the invitation of the Kao-mai-ke-si Diving and Underwater Engineering Company of France, we came specifically to greet the Chinese divers coming out of the depressurization chamber and to share their joy of completing the training session and setting another world record in 200 meter sea saturation diving in and out of the deep diving vessel.

Ten minutes after 7:00 pm on 29 April was a memorable moment. The deep diving vessel "SM360" docked in the harbor against the backdrop of a golden setting sun and the quiet surroundings appeared so serene. But the minds of the Chinese guests and the French technical crew gathered here were as unsettled as a turbulent sea. People's eyes were glued to the gate of the depressurizing vessel and lenses of photographic and movie cameras had already focused on the same target. Instrument readings and the fluorescent screen of television monitors told us that depressurization was progressing smoothly. Pressure in the vessel was approaching normal and the divers felt fine, everything was normal. Some diver was heard inquiring on the speaker about the menu of tonight's graduation banquet. At the turn of the handle, the gate opened and out came the sic Chinese divers. As the cameras repeatedly flashed, people clapped, cheered, greeted and congratualed. Every one of the young divers looked very vivacious and jubilant.

At that moment, one and a half years of difficult training in deep sea industrial diving drew to a victorious conclusion. At the banquet given by the ocean club, all the dives were awarded the highest third grade industrial diver certificates.

The technology of deep sea industrial diving is quite difficult and China has not had this technology in the past. In this diving exercise, six divers lived a full 7 days and 6 nights in the divers cabin of the deep diving vessel "SM360". They first met the challenge of being pressurized to 20 atmospheres in 24 hours and then they dived to a record 206 meters, left the vessel, swam in the deep sea and then returned to the vessel. After they surfaced, the depressurizing process was even more complex than the pressurizing sequence and it took 4 whole days toreduce the pressure to 1 atmosphere.

The first world record of deep sea saturation diving in and out a deep diving vessel was broken in the morning of 22 October 1980 by divers from China and France. They rode in the "SM358" deep diving vessel which measured 7 meters long, 25 meters wide and 2.8 meters high and weighed 12.8 tons. The cockpit holds the pilot and the copilots and the divers cabin holds three divers. At 10:30 am on that day, the vessel reached the target depth of 205 meters after 39 minutes of diving. Of course, the divers entered the divers' cabin from the high pressure chamber more than an hour ago. At 10:33, French diving instructor Ruo-si came out of the vessel first, followed by two young Chinese divers Liu and Shi and French teacher A-lai-ke-si came out last. They lingered underwater for 3 minutes and the vessel reached the surface at 11:16.

At the celebration banquet, we had a chat with the team leader. In more than a year's time, they have overcome various difficulties with the language barrier and with theoretical learning and, with unbending perserverance and courage and loyalty to their country, they finally overcame all the bstacles, succeeded in the actual deep sea diving and wond victory.

The deep diving vessel has the advantages of a submarine and a diving bell. Although a submarine can cruise freely under water, its crew cannot work outside it for any extended period of time. On the other hand, a diving bell can operate in the deep sea but it is limited to one location at a time and cannot move freely under water. A deep diving vessel is different, it not only can move freely underwater but it also allows the divers to work in the water at a certain depth and to carry out observations at greater depths and conduct work with mechanical arms. Consequently, more and more attention is given to the role of the deep diving vessel and deep sea industrial divers while continuous progress is being made in the exploration and development of offshore oil, in the installation of ocean bottom oil pipelines, and in other underwater engineering and refloatation activities. In view of the fact that the training of the young Chinese divers has reached a satisfactory level and based on the sound expectation of the developing trade between the two nations, Board Chairman Mr De-luo-zi of Kao-mai-ke-si Company presented concrete proposals at a reception luncheon for us regarding Sino-French cooperation in deep sea industrial diving. We anticipate even greater collaboration between China and France in this area and wish for speedy development of the Chinese deep sea industrial diving enterprise.

9698
CSO: 4008/3

AUTHOR: ZHANG Qianyuan [1728 0051 0626]
LI Yongsheng [2621 3057 3932]

ORG: None

TITLE: "Storied Industrial Buildings in Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The construction of storied industrial buildings in Shanghai started in the 1960's. Since the 1970's storied buildings have been used not only in light and electronic industries, but also in some machine-building industries. At present, many chemical works by built storied buildings according to the technological processes.

1. Main building parameters used in Shanghai: Column spacing: 6 m; Span: 6.0 m, 7.5 m, 9.0 m, 12 m (under experimentation); No of stories: mainly 2-6; Module: 0.6 m for buildings of 6 m in story height, and 1.2 m for those above 6 m; Working load for floor: 500, 750, 1000, 1500 kg/sq m.

2. Structural systems used:
(1) Prefabricated RC beams, slabs and long columns with exposed brackets (most widely used);
(2) Prefabricated RC beams, slabs and short columns;

[Continuation of JIANZHU XUEBAO No 8, 1981]

(3) Prefabricated RC beams and slabs and cast-in-place short columns;
(4) Prefabricated RC beams, slabs and long columns with built-in brackets.

3. The location of high temperature shops in storied buildings, either on the ground floor or on the upper floors, and the relevant problems have been discussed by the authors. The experience on ventilation shafts has also been treated.

4. Generally, shops with heavy equipment and bulky products are located on the ground floor. Care should be taken to avoid including shops which interfere with one another on the same floor or in the same building.

5. Usually 1.5-3 T freight elevators are provided. Bulky raw materials are treated first on the ground floor before taken upstairs.

AUTHOR: ZHENG Naigui [6774 0035 0964]
LIANG Mintao [2733 2404 3325]

ORG: None

TITLE: "Problems in Industrial Building Design"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The authors hold that the role and responsibility of architects in the design of industrial buildings should be sufficiently recognized. It is improper to leave everything to the technology and equipment designers with the architect in a passive position. As a matter of fact, due to the use of the most advanced techniques, industrial buildings are very capable of reflecting the characteristics of the times. Reviewing the development of architectural history, we can see that revolutions in architecture usually began with industrial buildings, for example, the Fagus Shoelast Factory in Germany in 1911, the "Model Factory" at the Cologne Exhibition in 1914, etc. Today, the design of industrial buildings should provide the laborers with good environments for working and living, and also good architecture. New design methods used today, both domestically and abroad, are reviewed in the article. The authors also propose a new structural system of industrial building design with the use of Y-section columns and three-hinged-arch roof-trusses as the main supporting members.

AUTHOR: LI Yuzhou [2621 3342 5297]

ORG: None

TITLE: "Reflections on Architectural Theory"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The author expresses his views on architectural theory. He does not agree with the idea that architectural theory is vague and useless and that there is no necessity for research. Reviewing what we have experienced during the past 35 years, we were usually guided by some ridiculous and fallacious theories, such as classic-revival, figurative and sloganized expressions. Studies on architectural theories in the past years were not founded on a sound basis, thus affecting the assessment of architectural theory.

To handle correctly the important problems in architectural theory, it is necessary to study materialism and dialectics. Some believe that subjective initiation determines architectural style and others hold that "form follows function" is a convention to be thrown to the winds. All such ideas run counter to the basic dialectic principle of "content determines form."

Architectural theory in China has long been influenced by that of the Russians in the 50's, which treated architecture as a plastic art. Renovations in architecture

[Continuation of JIANZHU XUEBAO No 8, 1981]

in the end of the last century was considered to be "the expression of degeneration and decadence of capitalism," with which "socialistic architecture" should be in sharp contrast. The social significance and cognition of architectural forms were exaggerated, classic inheritance and nationalistic forms advocated, and "ideological content" in architecture promoted. The principles of "socialistic realism" and "socialistic content and nationalistic form" in literature and art were improperly introduced into architecture.

The author disagrees that the new architecture of China can be made through some extension of classic members. There should be distinction between "novelty," "freshness" and the newness reflecting the age. The basic content of architectural renovation is to transform construction from a handicraft trade to a mechanized industry, to transform architecture from an art to a scientific technique.

AUTHOR: CHEN Zhanxiang [7115 0594 4382]

ORG: None

TITLE: "Evolution of Architect's Position in History"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 8, 1981

TEXT OF ENGLISH ABSTRACT: The author feels that the resumption of the title of architect in China is quite necessary. The title of architect has a long history. As early as 25 BC in ancient Roman era architect Marcus Vitruvius Pollio, in his "10 Books of Architecture," put forth the requirements of an architect, based on the fact that architecture was the joint production of various branches of learning. During the Middle Ages, however, the title of architect was lost for some time. Since then, the role and position of architect, as well as his ptogram and way of work, have undergone many changes.

The author arrives at the conclusion that the occupation of an architect is never an invariable one. It is inevitable in history that each age sets forth a different task and responsibility in the architect, depending on the different demands of the time. Today the architect plays a more important role in meeting the ever-changing demands of the people. Architectural design should be considered from a comprehensive view of the environment. It is quite an important problem in the architectural circle of all nations. In China, the position of architect must gain social

[Continuation of JIANZHU XUEBAO No 8, 1981]

recognition. Today the architect is not merely one who draws for the client, designs according to the client's desire, or, even worse, fawns upon the personal taste of a certain leader. An architect should therefore clearly realize his historical position and make full use of his initiative; otherwise, creativity in architecture could never be obtained.

9717
CSO: 4009/35

Coal Extraction

AUTHOR: QI Yingmin [2058 4481 2404]

ORG: Fushun Research Institute, Central Coal Research Institute

TITLE: "Calculation of Methane Emission from Coal Face and Ventilation Air Requirements for a Mechanized Coal Face"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 2, 1981 pp 20-29

ABSTRACT: Three major methane emission sources are considered. Methane emission from broken coal is governed by an exponential decay function. The total amount of methane emitted consists of the contributions from quantities of coal cut at successive moments in time; the formula for total methane emission from the broken coal assumes that the quantity of broken coal cut per unit time is constant. Finally, the broken coal methane emission equation allows for the fact that the coal cutting cycle ends at a certain point, so that the amount of broken coal available eventually decreases to zero. Methane emission from the goaf is a function of the pressure difference between the goaf and the working face. Methane emission from the face is a function of its area and its emission coefficient. The total methane emission formula is the sum of these three factors. It has a maximum at the end of the second stage of the coal cutting cycle, so that the expression for the maximum methane emission value can be derived. The methane emission inhomogeneity constant is the ratio of the maximum emission to the average emission. The required air supply is also calculated in terms of the maximum methane emission. The formulas suggest that the required air supply can be decreased by increasing the transport capacity of the conveyor and decreasing the length of the coal transport path.

AUTHOR: PAN Jian [3382 0256]

ORG: Changsha Nonferrous Metallurgy Design and Research Institute

TITLE: "A Verification of the Pipeline Resistance Formula for Two-Phase Flow and an Evaluation of Zhang Guoquan's formula"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 2, 1981 pp 48-54

ABSTRACT: Formulas for calculating the hydraulic pressure gradient of liquid-solid mixtures in pipeline transport are numerous, but still leave much to be desired. Recently many efforts at experimental verification of different formulas have been undertaken in China. A computer was used to calculate results for several formulas in common use in China, and these results were compared with more than 400 groups of actual measurement data from China and abroad. The formulas were those of Zhang Guoquan [1728 0948], the Jinquan Nonferrous Metals Company (which modifies the Durand equation by assuming an exponential relationship between the increase in the hydraulic pressure gradient and the volumetric concentration of solid), the Shaanxi Water Conservancy Research Institute, Wang Shaozhou [3769 4801 0719] and the Beijing Central Institute of Nonferrous Metals. The Jinchuan formula and the Shaanxi Water Conservancy Institute formulas give the smallest errors. The Zhang Guoquan formula is found to work well with suspensions of coarse particles but to show increasing errors for finer particle size, greater concentration and higher specific gravity.

8480
CSO: 4009/47

AUTHOR: LIU Zhenrong [0491 6297 2837]

ORG: Institute of Engineering Mechanics, Chinese Academy of Sciences

TITLE: "Application of Graph Theory to Optimization of Nodal Numbering for a Finite Element System"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 129-137

TEXT OF ENGLISH ABSTRACT: In this paper, the least degree principle in ordering vertices of a graph is used. In the first part, an introduction is given of the general procedure for application of the reversed Cuthill-Mckee (RCM) algorithm to minimize the storage requirement of data during computer implementation for the finite element technique. It is emphasized that renumbering the set of nodal points is but a process to construct a special kind of data structure--the so-called spanning tree. In the second part a computing experiment is carried out to study the effect of different types of element meshes on the result of the RCM scheme. The superiority of the system of right triangular elements with quadratic variation of shape function and the storage requirement are presented in the conclusions.

AUTHOR: SHI Yingguang [0670 2019 0342]

ORG: Computing Center, Chinese Academy of Sciences

TITLE: "On the Simultaneous Best Approximation for Dunham Types"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 138-142

TEXT OF ENGLISH ABSTRACT: In this paper, we discuss the problem of simultaneous best approximation for the Dunham type, i.e., one of minimization of the functional $\Phi(P) = \max \{\|f^{+} - P\|, \|f^{-} - P\|\}$. We have given a characterization theorem and proved a strong uniqueness theorem and a continuity one. Finally, we have provided an algorithm for calculating the best approximation.

AUTHOR: WANG Yinchu [3769 1377 0443]

ORG: Computer Installation of Jiangsu Planning Committee

TITLE: "An Algorithm for a Transport Problem with Restricted Ability"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 143-148

TEXT OF ENGLISH ABSTRACT: This paper is based on the connection of differential method with potential method to solve the general transport problem. We present a method which does not need to store enormous matrix of coefficients of the constraint condition, and the implied information within the closed path of the potential method is used in order that we may obtain the solution of the transport problem with restricted ability.

AUTHOR: WANG Jiamo [3769 0857 6206]

ORG: Ninth Research Institute

TITLE: "Parallel Calculation in an Accumulated Problem"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 149-155

TEXT OF ENGLISH ABSTRACT: In this paper we give a format for the parallel calculation of a partitional block with the characteristics of a longitude-horizontal parallel computer. It has been used to compute an accumulated problem. The format has provided a good parallel calculational effect.

AUTHOR: ZHU Chuheng [4376 2806 1854]

ORG: None

TITLE: "Application of Interpolation for Definite Integral with Parameters"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 156-162

TEXT OF ENGLISH ABSTRACT: In this paper the following definite integrals:

$$J(r_1, r_2, \cdots, r_n) = \int_{r_1(r_1, r_2, \cdots, r_n)}^{r_2(r_1, r_2, \cdots, r_n)} F(x)dx,$$

and

$$I(\alpha_1, \alpha_2, \cdots, \alpha_n; \lambda) = \iint_{D} f(x)g(\lambda y)dxdy$$

are considered, where $r_1, r_2, \ldots, r_n$ and $\alpha_1, \alpha_2, \ldots \alpha_n, \lambda$ are parameters, and the integrated region D is defined by the following relations:

$$\psi_1(\alpha_1, \alpha_2, \cdots, \alpha_n) \leqslant x \leqslant \psi_2(\alpha_1, \alpha_2, \cdots, \alpha_n),$$
$$\varphi_1(\alpha_1, \alpha_2, \cdots, \alpha_n, x) \leqslant y \leqslant \varphi_2(\alpha_1, \alpha_2, \cdots, \alpha_n, x),$$

where $(x, y) \in D$.

A numerical method of computation for definite integral $J(r_1, r_2, \ldots, r_n)$ and

[Continuation of SHUZHI JISUAN YU JISUANJI YINGYONG Vol 2 No 3, 1981 pp 156-162]

$I(\alpha_1, \alpha_2, \ldots, \alpha_n; \lambda)$ is introduced. The author makes use of the interpolation and numerical method of ordinary differential equations as the basic idea for computing $J(r_1, r_2, \ldots, r_n)$ and $I(\alpha_1, \alpha_2, \ldots, \alpha_n; \lambda)$.

AUTHOR: HUANG Fengling [7806 7458 3781]
RUAN Yuxiang [7086 3768 7449]
LIU Zhiyong [0491 5268 3938]
WU Qiufeng [0702 4428 1496]

ORG: All of Qinghua University

TITLE: "Exploration Using Computer for Method Assisting Diagnosis of Acute Abdominal Pain"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 163-168

TEXT OF ENGLISH ABSTRACT: Two different methods are presented in this paper. One is to simulate a doctor's experience based on fuzzy sets theory. The other is the so-called maximum likelihood method in probability statistics.

Both methods were tested and verified in more than 1000 cases of common acute abdominal pain which were diagnosed by operation or final clinical diagnosis. The results show that the accuracy of simulating the doctor's method is as high as 97.7 percent, while that of the probability statistics method is only 91.2 percent.

AUTHOR: LI Kaitai [2621 7030 3141]
HUANG Aixiang [7806 5337 7449]

ORG: Both of Xi'an Jiaotong University

TITLE: "Iterative Method of the Finite Element Solution for a Nonlinear Boundary Value Problem"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 169-174

TEXT OF ENGLISH ABSTRACT: If the operator of a nonlinear boundary value problem is a monotone one, then the iterative method of the finite element solution may be given. In doing so, it is not necessary to solve the system of nonlinear algebraic equations, but to construct the basis and the dual basis functions of the finite element subspace. In addition, this article has proved the covergence of the approximate solution.

AUTHOR: WANG Zeke [3769 0463 2688]

ORG: Zhongshan University

TITLE: "An Implementation of Kuhn's Rootfinding Algorithm for Polynomials and Related Discussions"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 175-181

TEXT OF ENGLISH ABSTRACT: According to a complementary pivoting procedure, H.W. Kuhn presented an algorithm that generates sequences to converge all the roots of a polynomial with complex coefficients. In this paper we give a detailed analysis of Kuhn's algorithm and consider a practical strategy for computation. After giving an outline of the program and a flow chart, some numerical examples are presented and the behavior of the algorithm is discussed. In addition, it is pointed out that the algorithm remains effective for a wide class of transcendental equations.

AUTHOR: LIU Degui [0491 1795 6311]

ORG: None

TITLE: "A Class of Deformation of Ordinary Differential Equations in Calculation of Control Systems"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 182-190

TEXT OF ENGLISH ABSTRACT: In order to avoid the calculating derivation, an efficient way of numerical integration of ordinary differential equations was proposed by Yuan Zhaoding. In this paper, another new method of substitution is presented. This method either can completely avoid the calculating derivation on the right or can decrease to calculating the m-n order of derivation in numerical integration of ordinary differential equations. The calculation of initial values for solving systems of the equivalent equation is much simpler than that by the transform method.

In this paper the method of substitution is derived and shows that this method is also applicable when an enter variable is a δ function.

AUTHOR: WANG Qi [3769 3823]

ORG: Shenyang Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "On Self-inverse Transformation"

SOURCE: Beijing SHUZHI JISUAN YU JISUANJI YINGYONG [JOURNAL OF NUMERICAL METHODS AND COMPUTER APPLICATIONS] in Chinese Vol 2 No 3, 1981 pp 191-193

TEXT OF ENGLISH ABSTRACT: In this paper we give a method of generating the self-inverse transformation of the form $S = I - uv^T$ and $S = S^{-1}$, and with its specific form solve the linear equations. The numerical stability is good. The volume of computation is more than the Gauss elimination and less than the Householder method. This paper might be regarded as a note to Tan's article.

9717
CSO: 4009/3

Engineering

AUTHOR: ZHAO Guanchun [6392 0385 2504]

ORG: Department of Power Machinery Engineering (II)

TITLE: "The Construction and Use of Table and Chart for the Thermodynamic Properties of Supersaturated Steam and an Accurate Equation for Steam Pressure in Equilibrium with Spherical Drops"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 1-12

TEXT OF ENGLISH ABSTRACT: Using the formulas for calculating thermodynamic properties of superheated steam, as proposed by IFC (1976), the author has succeeded in developing a computer program for calculating the thermodynamic properties of supersaturated steam within the region between the saturation line and the 95 percent line of dryness fraction, and has turned the results into a table and a chart accordingly. This paper proposes an accurate equation for the steam pressure in equilibrium with spherical drops. By using such an equation, a simple and accurate method is suggested for computing the critical droplet radius or degree of supersaturation using the supersaturated steam table. To provide a concrete comparison of the relative merits of the suggested method and other methods, it may be cited that over a region up to 250°C, 60 bars and 0.95 dryness fraction, the error of calculation by the new method is less than 1 percent, as compared with 10-26 percent obtained by the other methods.

AUTHOR: CHEN Chunzheng [7115 4783 2973]

ORG: Department of Power Machinery Engineering (II)

TITLE: "The Stability of Rubber-stabilized Air Bearings Used on Medium-pressure Expansion Turbines"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 13-25

TEXT OF ENGLISH ABSTRACT: This paper describes some research results on the rubber-stabilized air bearings used on medium-pressure expansion turbines which are installed in 150 N m^3/h oxygen plants. The author has calculated the instability onset speed of the turbine rotor under different experimental conditions by means of a formula derived from a simplified model. Analysis of the calculation and comparison with experimental results enable the following principal conclusions to be reached: (1) The use of a rubber-stability air bearing can greatly raise the instability onset speed of the rotor. These rubber-stabilized air bearings will operate stably with large radial clearance under low air supply pressure. (2) A change in radial clearance of the rubber-stabilized air bearing does not affect the operating stability within the range of our experiments. (3) The reduction in bearing weight can sufficiently raise the instability onset speed. Therefore, it is preferable to select materials of lower specific weight for the bearing

[Continuation of XI'AN JIAOTONG DAXUE XUEBAO Vol 15 No 4, Aug 81 pp 13-25]

body rather than to use a LC_4 shaft. (4) Both the ratio of the damping coefficients and that of the stiffness coefficients of the rubber O-rings and the gas film have optimum values at which the bearings operate with maximum stability. It is obvious that the correct selection of rubber O-rings is very important.

AUTHOR: WANG Xifan [3769 6932 0416]
SHI Hanji [2457 3352 1015]

ORG: Both of the Department of Electrical Engineering

TITLE: "A Direct Solution to the Structure Symmetric Sparse Linear Equations"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 27-42

TEXT OF ENGLISH ABSTRACT: A new type of algebraic simultaneous equations, the structure symmetric sparse linear equation, is discussed in this paper. The paper presents an analysis of its essential properties as revealed in the triangular decomposition process, and discusses the characteristics of three optimal ordering methods for the solution of the structure symmetric sparse equations. Comparison of these methods is given and an optimal ordering method which suits this kind of equation is recommended.

Paralleling the presentation of the optimal ordering method mentioned above, the paper develops an efficient algorithm for directly solving this type of linear equation. The method can easily be extended to solving symmetric sparse linear equations. The paper also contrasts the newly developed algorithm with the variable band method that has found wide application in China.

AUTHOR: ZOU Lihe [6760 3810 0735]

ORG: Department of Information and Control Engineering

TITLE: "Orthogonal Invariance in Integral Transforms"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 43-50

TEXT OF ENGLISH ABSTRACT: This paper presents a concept of orthogonal invariance in linear transforms; that is, if any orthogonal set of functions can keep its orthogonality invariant after a linear transform, this transform is defined as possessing the property of orthogonal invariance transform (OI). Necessary and sufficient conditions are developed for integral transforms and for linear systems. An integral transform is an OI if and only if the complex conjugate inner product of its kernel is an impulse function; and a linear system is an OI if and only if its magnitude of transfer function is uniform in spite of its phase characteristic. The OI concept can be used in the fields of signal analysis, data transmission, digital signal processing, etc.

AUTHOR: ZHANG Jinghui [1728 2529 4940]

ORG: Department of Engineering Mechanics

TITLE: "Analysis of Structural Response to a Sequence of Random Impacts"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 51-58

TEXT OF ENGLISH ABSTRACT: The main content of this paper may be summarized as follows:
(1) The mode of the response of a system with single degree of freedom to a sequence of random impacts can be idealized as an exponential oscillation decay,
(2) The analytical method is presented that handles the response of a complex system to a "structural shock wave," widely encountered in practice.

A technique for obtaining the parameters of the "structural shock wave" from experimental data is proposed.

AUTHOR: LIN Yuqi [2651 3022 6936]

ORG: Department of Engineering Mechanics

TITLE: "Equivalent Bending Moment Method for the Calculation of Beam (or Shaft) Deflections"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 59-69

TEXT OF ENGLISH ABSTRACT: In this paper a numerical method for calculating beam (or shaft) deflections is developed. A new concept of equivalent bending moment has been introduced, whence comes the term "Equivalent Bending Moment Method" (EBMM).

The basic idea of EBMM is that a beam region expressed by a bending moment equation is substituted by a beam region with invariable equivalent bending moment. By means of the substitution the amount of calculation of beam deflection is reduced and precise results are obtained. Furthermore, this method is readily adaptable to computer programming.

EBMM can be used to evaluate the deflection of statically determinate and indeterminate beams, that of beams with constant and step variable cross sectional areas

[Continuation of XI'AN JIAOTONG DAXUE XUEBAO Vol 15 No 4, Aug 81 pp 59-69]

and of combinatory beams (or shafting). When this method is applied to beams (or shafts) with step variable cross sectional areas under complex loads, its advantage is most noticeable.

This method can also be extended to the calculation of frames.

AUTHOR: CAI Rufen [5591 1172 5358]
LU Zhenrong [4151 2182 2837]

ORG: Both of the Department of Basic Courses

TITLE: "A Study of the Numerical Analysis, Programming and Plotting Software for the Approximate Representation of an Ellipse"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 71-82

TEXT OF ENGLISH ABSTRACT: Based on a comparison of various drawing methods, this paper presents a numerical analysis of the representation of an ellipse that best approximates the accurate one. The functional relationship between the two radii of the ellipse, its revolving angles and four parameters, needed for automatic plotting, is obtained.

After establishing this mathematical model, four circular arcs are used to realize the simulated plotting of this ellipse. Then the circle interpolation method of the HTJ-1855 computer graphics system is used to edit the graphics software which is stored as a subroutine in the macro instruction library of the system.

This subroutine is provided to be called at any time by the designers if needed for plotting ellipses of any size and any orientation of major axes.

AUTHOR: GAO Yingcai [7559 2019 2088]

ORG: Department of Mathematics

TITLE: "Semi-discrete Method for Second Order Equation Time-dependent Problems--Computation and Error Estimation"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 83-95

TEXT OF ENGLISH ABSTRACT: In this paper, a finite element approximation solution is established by a finite element discrete space variable, and by characteristic function expansion of time variable for hyperbolic and parabolic equations. This is the so-called semi-discrete method. In addition, the L^2-error estimation of approximation solution is obtained. The results of computation by the semi-discrete method are then compared with the correct solution.

AUTHOR: WU Songzheng [1566 2646 2823]
CHEN Shoutian [7115 1108 3944]

ORG: Both of the Department of Electrical Engineering

TITLE: "On the Model of Negative Valued Dielectric Losses"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 97-106

TEXT OF ENGLISH ABSTRACT: This paper investigates the influence of surface resistance and the width of the guard electrode gap on dielectric losses when measured at power frequency. It is found that the vaseline-gap T-network cannot be sufficiently described in respect to the cause of negative value arising when dielectric losses. The paper also points out that the width of the gap should be as narrow as possible rather than as wide.

AUTHOR: YANG Gao [2799 4108]

ORG: Department of Power Machinery Engineering (I)

TITLE: "The Determination of the Time Lag of the Pressure Measurement System with Intermittent Air Purging"

SOURCE: Xi'an XI'AN JIAOTONG DAXUE XUEBAO [JOURNAL OF XI'AN JIAOTONG UNIVERSITY] in Chinese Vol 15 No 4, Aug 81 pp 107-116

TEXT OF ENGLISH ABSTRACT: Intermittent purging can be used in the pressure measuring system of a wet-steam Laval nozzle test facility. The author has made a quantitative analysis of the effect of the response time t* of the purging system on the measurement of pressure. A mathematical model for this system is first formulated and the author then derives an equation that is good for engineering use. Experimental equipment has been designed for the verification of the theoretical analysis and tests are made to determine the response time t*.

The accuracy of the equation has been proved ty the experiment. The results of this research may contribute to the rational design and correct operation of the pressure measurement system for wet-steam flows.

9717
CSO: 4009/5

Metallurgy

AUTHOR: ZHOU Bangxin [0719 6721 2450]
LIU Qixiu [0491 6386 4423]

ORG: None

TITLE: "Recrystallization of Al and Cu Single Crystals after Tensile Deformation"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 363-373

TEXT OF ENGLISH ABSTRACT: An investigation was conducted of the relationship between the orientations of recrystallized grains, the deformation amount and the tensile temperature with the tapered single crystals of Al and Cu. In Al single crystals, the orientations of recrystallized grains became concentrated when plastic deformation fully entered into the third work hardening stage during tensile test at -78 - 300°C, and had a crystallographic relationship with the deformed parent in rotating around the $[1\bar{1}1]$ about 30-50°C, but it was random after tensile test at -196°C. In Cu single crystals, the orientations of recrystallized grains were also random after tensile test at 20-400°C.

In consideration of the difference of stacking fault energy in Al and Cu and in Al with decreasing temperature, the deformed structure in the third work hardening stage would be different. From the point of view of the nucleation of recrystallization occurring by the growth of subgrains of large difference in orientation

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 363-373]

with the surrounding matrix and of taking the lead during the recovery process, the different relationship between the orientations of recrystallized grains and the deformed parent can be explained.

AUTHOR: ZHAO Bolin [6392 0130 7792]
et al.

ORG: None

TITLE: "On the Space Group of μ-phase in Superalloy GH302--Electron Diffraction of Primitive Hexagonal Lattice μ-phase"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 386-393

TEXT OF ENGLISH ABSTRACT: A study was made of the electron diffraction patterns of extracted μ-phase which were identified with those of X-ray powder diffraction in superalloy GH302. It is shown that the reflections with $-h+k+\ell \neq 3n$ spots, e.g., {100}, {200}, etc., in the [001] zone and $\{1\bar{1}0\}$, $\{\bar{1}01\}$, etc., in [111] zone (indexed as hexagonal) are forbidden for the $R\bar{3}m$ space group. These "forbidden" diffractions cannot be attributed to double diffraction with either non-zero Laue zone or other phases, such as $MgZn_2$ type Laves phase. Based on diffraction extinction law, it seems to be a primitive hexagonal lattice (P6). Its lattice constant is consistent with that of μ-phase ($R\bar{3}m$) described as hexagonal. It may be a kind of local-ordering structure of μ-phase.

AUTHOR: FU Jie [0265 2638]
CHEN Enpu [7115 1869 2528]
CHEN Chongxi [7115 1504 4406]
et al.

ORG: All of Beijing University of Iron and Steel Technology

TITLE: "Effect of Temperature Distribution Around the Molten Slag Pool on Ingot Quality during ESR Process of Superalloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 394-402

TEXT OF ENGLISH ABSTRACT: The effect of temperature at slag face on Al and Ti control and the relation between temperature distribution around liquid metal pool/molten slag pool interface and quality of ingot surface have been investigated during ESR process of superalloy. If the insulation of the mold from its base plate was poor and rather higher temperatures appeared at slag face, in the later refining stage the rate of O_2 penetration to slag from atmosphere, $\nu^{O_2}_{s-g}$, is two to three times faster and also in the earlier stage the tendency toward the Al increasing is greater than that of good insulation. An increase in voltage may cause the temperature at slag face to rise and the Ti loss to accelerate, e.g., every 0.03 percent more Ti loss at nearly 1 V increase.. The temperature distribution around liquid metal pool/molten slag pool interface may be expressed by $t = ae^{B/d}$ $(B<0)$,

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 394-402]

and has a great influence upon the quality of the ingot surface. The method to ascertain this temperature distribution is presented. The evaluation of quality may be proposed by the change of slag coating thickness, $\delta = B/(\ln t_1 - \ln a)$. It is shown that the quality of ingot surface is perhaps dependent on the electric current distribution in the molten slag pool, the heat conducting conditions at mold wall, the liquid temperature of slag and the change of all factors affecting the temperature at the "high temperature region."

AUTHOR: SHU Daixuan [5289 0108 5503]
MAO Minghua [3029 6900 5478]
CHEN Jiayong [7115 1367 6978]

ORG: All of the Institute of Chemical Metallurgy, Chinese Academy of Sciences

TITLE: "Preliminary Studies on Kinetics of High Pressure Hydrogen Reduction of Nickel Ion in Aqueous Solution to Metallic Nickel"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 403-411

TEXT OF ENGLISH ABSTRACT: Studies were made on high pressure hydrogen reduction of Ni ammoniacal solution to metallic Ni with fine Ni powder, which was also prepared by hydrogen reduction with Cr^{2+} as nucleating agent, added as solid seed. Results indicate that the reduction was carried out under chemical reaction rate control region. The rate of reduction is proportional to the amount of Ni powder as solid seed added, and to the square root of partial pressure of hydrogen, and is not influenced by the concentration of Ni ion in solution up to most of Ni reduced. Both activation of hydrogen molecules and phase transformation of Ni are believed to proceed on the surface of Ni powder added. The reaction can be considered to proceed according to the following scheme with reaction 4 as the rate controlling step:

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 403-411]

(1) $H_2(g) \rightleftharpoons H_2(1)$ fast

(2) $H_2(1) \xrightarrow{\text{nucile}} 2H^{*}$ fast

(3) $(Ni^{2+}) \xrightarrow{\text{nuclei}} (Ni^{2+})$ fast

(4) $2H^{*} + (Ni^{2+})^{*} \xrightarrow{\text{nuclei}} Ni^{0} + 2H^{+}$ slow

(5) $2H^{+} + 2NH_3 = 2NH_4^{+}$ fast

AUTHOR: GUAN Hengrong [4619 1854 2837]
LOU Hanyi [2869 5060 0001]
MAO Xiaoyu [3029 2556 4416]
et al.

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Deterioration of Aluminide Coating on Nickel-base Superalloys"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 412-417

TEXT OF ENGLISH ABSTRACT: The deterioration of aluminide coating formed on two cast nickel-base superalloys by pack cementation or by vapor calorizing under reduced pressure has been investigated. To evaluate the coating stability, the oxidation tests were made by exposure to static air under 800-1000°C for 3000-5000 h or 1100°C for 100 h. The microstructures of these coatings formed not only by both processes but also on both alloys are quite similar. It is observed that the outer zone of coating consists mainly of NiAl and Ni_2Al_3 phases on which the Ti (C, N) and Al_3Ti are dispersed; and the inner zone is composed of NiAl, Ni_3Al, Ti (C, N), $M_{23}C_6$ and M_6C near the underlying metal. The deterioration of the aluminide coating after a long-term exposure at elevated temperature seems to be closely related to the phase transformation of the outer zone, the sequence of which may be as follows:

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 412-417]

$$Ni_2Al_3 + NiAl(\text{enriched in Al}) \rightarrow NiAl(\text{enriched in Ni}) \rightarrow$$
$$\rightarrow NiAl + Ni_3Al \rightarrow Ni_3Al \rightarrow Ni_3Al + \gamma$$

The Ni_2Al_3 and NiAl(enriched in Al) phases are extremely unstable and disappear after a short exposure below 1000°C, while NiAl(enriched in Ni) phase is very stable and not even altered to Ni_3Al after being oxidized at 900°C for 5000 h. The nucleation of the Ni_3Al phase along the grain boundary of NiAl indicates the initiation of coating deterioration. An end of its deterioration is that the transformation of NiAl into $Ni_3Al + \gamma$ is just finished. The granular phases in the inner zone are carbides, mainly $M_{23}C_6$ or M_6C differing with either alloy, all of them disappearing at 1100°C. It is also found that the σ phase in the diffusion zone may vanish after 100 h exposure at 1000°C.

AUTHOR: LI Fanghua [2621 2455 5478]
WANG Yinjun [3769 5593 0689]
TENG Chenming [3326 2525 2494]
GAO Junjie [7559 0193 2638]

ORG: LI, WANG and TENG all of the Institute of Physics, Chinese Academy of Sciences; GAO of Tianjin University

TITLE: "Changes in Structure, Magnetic Anisotropy and Magnetic Domain of Amorphous Gd-Co Alloy Films"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 418-423

TEXT OF ENGLISH ABSTRACT: Changes in the structure and the magnetic domain patterns in amorphous Gd-Co alloy films after annealing at room temperature in a low vacuum of 10^{-2} mm Hg for two weeks as well as heating in a high vacuum of 5×10^{-7} mm Hg were investigated by electron diffraction and Lorentz electron microscopy. It was found that the phase separation could be achieved either by annealing at room temperature in a low vacuum or by heating in a high vacuum. The diffraction intensity profiles of the films and their magnetic domain patterns were changed as a result of phase separation. The nearest neighbor coordination number between Gd and Co atoms was obviously decreased, meanwhile the magnetic bubbles in the domain patterns apparently decreased or even disappeared, resulting in the fact

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 418-423]

that the in-plane domain appeared. This proves once again that the magnetic anisotropy in amorphous Gd-Co alloy films is definitely related to the nearest neighbor coordination number between Gd and Co atoms and that the latter may be intuitively shown in the electron diffraction intensity profile.

It was also found that during heating at 350°C, Co crystallized first with α-Co as its main product and β-Co the subordinate. The α-Co gradually transformed into β-Co with the increase in temperature. The oxidation of Co had not been observed even at 950°C, while Gd was oxidized seriously before its crystallization. No trace of Gd-Co alloy or metal Gd could be found in the whole process of crystallization.

The change of the magnetic domain patterns with the heating temperature was shown in the present paper. The influence of both the phase separation and the degree of short range order on the magnetic anisotropy in films was discussed.

AUTHOR: XIAO Wentao [5135 2429 3447]
ZHU Jinghan [4376 2529 3352]
SUN Tianduo [1327 1131 6995]

ORG: All of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "30MGs·Oe Sm-Co Permanent Magnets Prepared by Liquid Phase Sintering"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 424-432

TEXT OF ENGLISH ABSTRACT: A study was made of the optimum composition of 2-17 type Sm $(Co, Cu, Fe, Zr)_Z$ magnets. It shows that Sm content is about 27 wt percent, instead of the 25.5 wt percent reported by Ojima. It is shown that the liquid phase sintering process, rather than a simple solid phase sintering, is favorable for controlling and adjusting exactly their compositions, for playing a fully active role in step aging treatment, for enhancing strongly the coercivity and energy product and for successfully preparing magnets with excellent properties. The highest value of the energy product, 30.5 MGs·Oe, has been obtained.

AUTHOR: HE Zhongzhi [0149 1813 3112]
LIU Zhifu [0491 3112 6346]
ZHANG Baicheng [1728 4102 2052]
ZHANG Wenrun [1728 2429 2387]

ORG: All of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "Effect of MnS and Slab Reheating Temperature on Properties of Oriented Grain Fe-3 percent Si"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 433-440

TEXT OF ENGLISH ABSTRACT: The suitable contents of such effective constituents determined on the basis of the MnS process may be available to produce the oriented-grain Fe-3 percent Si as: C 0.03 - 0.05 percent, Mn 0.06 - 0.08 percent, S 0.018 - 0.025 percent, [Mn] [S] = (11-20) x 10^{-4} and O_2 0.007 percent. The magnetic properties of Fe-3 percent Si have also been influenced by the slab reheating temperature. It was observed that with the raise of the reheating temperature, the primary grain size was reduced and the secondary coarsened, and thus its magnetic properties could be remarkably improved, $B_{10} > 1.78$ Wb/m^2, and stabilized. The proper reheating temperature became relatively insensitive to the magnetic properties when an appropriate amount of Al and N_2 was added. The secondary grains

[Continuation of JINSHU XUEBAO Vol 17 No 4, Aug 81 pp 433-440]

may coarsen and the B_{10} value may improve further. The starting temperature of the secondary recrystallization seems to be in correspondence with that at the beginning of rapid growth of primary grains and of the aggregation of MnS particles.

AUTHOR: LI Jun [2621 6511]
CHEN Yulian [7115 3558 1670]

ORG: Both of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "An Investigation of Fine Grains in the Product of Oriented-grain Silicon Steel Sheet with High Induction"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 441-446

TEXT OF ENGLISH ABSTRACT: The fine grains in the product of oriented-grain silicon steel sheet with high induction have been investigated using the metallographic etch pits technique. It was shown that when the slab was reheated under an exceedingly high temperature, the hot rolled band of large elongated grain structure may be produced, and its $\{100\}\langle 011\rangle-\langle 001\rangle$ components in the primary recrystallization texture are enhanced. In these regions the primaries are enlarged and the lined grain structure appears after the final annealing. While the slab is reheated under lower temperatures, the product in which the solution of the MnS and AlN is not yet completed may be obtained with mixed grain structure. In addition, it is presented that the lined fine grain structure could be reduced or prevented by increasing the carbon content of the steel, by raising hot reduction or by adopting two stages in cold rolled process.

AUTHOR: YIN Ruiyu [3009 3843 6877]
ZHANG Yaohui [1728 5069 6540]

ORG: Both of the Laboratory of Tangshan Iron and Steel Company

TITLE: "Effect of FeO_n on Properties of Converter End Slag (Low P Content)"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 447-453

TEXT OF ENGLISH ABSTRACT: The effect of FeO_n on the properties of converter end slag (low P content) has been studied with phase diagram analysis and petrograph observation. Referring data taken from end slag of oxygen blow converter to the $CaO-SiO_2-FeO_n$ system, the phase equilibrium under elevated temperatures is calculated and regressed. Thus, the relationship between FeO_n contained and percentage of balanced liquid phase in converter slag (low P content), of which C_2S, C_3S and CaO already crystallized out, may be obtained. It is demonstrated that adjustment of FeO_n content is significant in relation to the properties of the converter end slag. Furthermore, certain problems, such as the slag viscosity, "slag melting" and slag making with respect to slag properties, have also been discussed.

AUTHOR: DOU Shixue [4535 1102 1331]
LIU Huakun [0491 0553 0981]

ORG: Both of Northeast Institute of Technology

TITLE: "Determination of Equilibrium Constant for Silicate Melt Polymerization and Its Application"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 454-460

TEXT OF ENGLISH ABSTRACT: An attempt was made to ascertain the correlation of equilibrium constant of the polymerization of binary silicate melts with the chemical bond parameters, such as ratio of the effective nuclear charge of metallic ion to its radius, as well as the ionization potential and electronegativity in Allred-Rochow scale. The three-parameter equation derived was employed to estimate the equilibrium constant by which the polymerization of certain binary silicate systems is characterized. It also evaluated the activities of metallic oxides, the anion distribution in silicate and mean chain length, etc., in connection with expression of polymerization. The results show that both free oxygen ion concentration and degree of silicate polyanion polymerization increase with the increase of the charge-radius ratio, ionization potential and electronegativity in Allred-Rochow scale. Fair agreement of the calculated values of activities with experimental data was found. This may be available to predict some properties of silicate melts.

AUTHOR: NING Yuantao [1380 6678 3447]
WANG Yongli [3769 3057 4539]
YUAN Qilong [5913 0796 8263]

ORG: NING and WANG both of the Institute of Precious Metals; YUAN of the Nanjing Institute of Glass Fiber

TITLE: "A Bond Parameter Approach to Wettability of Molten Glass on Pt Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 461-466

TEXT OF ENGLISH ABSTRACT: The bond parameter approach to the wetting behavior of molten glass on certain Pt alloys was attempted on the basis of their equilibrium contact angle tests. It seems to indicate that the dependence of the wetting behavior on the bond parameters of pure metals and Pt-alloy constituents, as well as glass components themselves, may be qualitatively generalized.

AUTHOR: SUN Xiaokai [1327 2699 7030]
XIONG Liangyue [3574 5328 6885]
LONG Qiwei [7893 2601 1218]

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "Evaluation of Brittle-fracture Surface Energy in Cubic Metals by Lattice Dynamic Method"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 467-477

TEXT OF ENGLISH ABSTRACT: Using the method of linear response theory in lattice dynamics on the basis of Tyson's model, the response displacements of atoms on cleavage plane on incipient brittle fracture were derived and an expression for evaluating brittle fracture surface energy of metals was found. The brittle fracture surface energy for a number of bcc and fcc metals has been calculated and the results coincide with the order of magnitude in experimental measurements.

AUTHOR: WEI Wenguang [7614 2429 0342]
WANG Guangsheng [3769 1639 3932]
ZHANG Zhonglin [1728 0022 2651]
LU Dingchang [7120 0002 2490]

ORG: All of Changcheng Steel Works

TITLE: "Double-specimen Method for J_{IC} Testing"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 478-483

TEXT OF ENGLISH ABSTRACT: Based on the linear relationship between Δa and Δp of a cracked specimen in the stable growth stage and after yielding of the toughness band, a new method using double-specimen for J_{IC} testing was developed by essential estimation of medium or high toughness materials. Its simplicity and accuracy may be available to the industrial laboratories on the requirement of engineering design.

AUTHOR: GAO Huaisun [7559 2037 5549]
JIANG Jingkai [5592 2529 0418]

ORG: Both of Baotou Institute of Metallurgy Research

TITLE: "On the Self-powdering of RE-Si-Fe Alloy"

SOURCE: Beijing JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese Vol 17 No 4, Aug 81 pp 484-488

TEXT OF ENGLISH ABSTRACT: An investigation of self-powdering of RE-Si-Fe alloy was conducted by means of. X-ray diffraction analysis and electron microscopy. It is identified that the presence of REP, or CeC_2, La_2C_3 may be the cause of self-powdering when it is exposed to weather or soaked in water. Its self-powdering behavior is aggravated by both hydrogen embrittlement and stress corrosion.

9717
CSO: 4009/18

Scientific Instruments

AUTHOR: None

ORG: Research Group of Microwave Moisture Measuring Apparatus, Institute of Building Physics

TITLE: "The Development of Microwave Non-destructive Moisture Measuring Apparatus"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 1-9

TEXT OF ENGLISH ABSTRACT: In this paper, the basic theory of non-destructive moisture measuring by microwave is briefly introduced. The composition of the 3 cm wavelength apparatus is described, as well as its principal technical characteristics. The features of the apparatus are: powerful microwave generator, 4∼6 watt output; two operating conditions; continuous equiamplitude oscillation; high sensitivity microwave receiver, limiting sensitivity is 120 dB/W. This means that the apparatus has a wider range. The method of calibration and its errors are discussed in detail. Several typical curves obtained as a result of experimentation of building materials as well as in moisture measuring of some walls are presented. Regarding effects on factors, such as salt content in building materials and wall, rendering surface, distribution of reinforcement bars in wall construction, temperature, etc., microwave moisture measurement is described.

AUTHOR: XIA Zhishi [1115 1807 4258]

ORG: Northwestern Polytechnical University

TITLE: "Minimal Displacement-to-Frequency Converter"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 10-17

TEXT OF ENGLISH ABSTRACT: This paper presents the principle and mathematical analysis of a new minimal displacement-to-frequency converter which is based on the t application of the multivibrator. In order to make wide use of the converter, this paper introduces a pressure-to-minimal displacement converter and a frequency-to-voltage converter which are relative to the applications of the minimal displacement-to-frequency converter. In addition, this paper presents a pressure-to-voltage converter which is based on this principle. These simple and cheap converters may be used to measure minimal displacement up to 0.01 μ and pressure of 10^{-4} kgf/cm^2 with the pressure varying rapidly.

AUTHOR: CHEN Zeshao [7115 0463 7300]
GE Xingshi [5504 2450 4258]

ORG: Both of the University of Science and Technology of China

TITLE: "A New Multifunctional Apparatus for Measuring Thermophysical Properties"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 18-25

TEXT OF ENGLISH ABSTRACT: In this paper a new continuous adiabatic plate type calorimeter based constant heating rate has been designed and constructed. By this calorimeter it is possible to measure simultaneously the thermophysical properties, such as specific heat and thermal conductivity in solid and liquid states, and latent heat of the phase change materials. Theoretical analysis is carried out for this apparatus and the measuring technique based on the theory presented is described. Measurements of the thermophysical properties of the H_2O, glycerine and $Na_2SO_4 \cdot 10\ H_2O$ shows that the data obtained using the apparatus described agree well with those of the reference books. The error of the apparatus is analyzed.

AUTHOR: HUANG Lanyou [7806 5695 0645]
LIU Xuping [0491 4872 1627]

ORG: Both of the Scientific Instrument Factory, Chinese Academy of Sciences

TITLE: "Magnetic Circuit Design of Magnetic Lenses"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 26-34

TEXT OF ENGLISH ABSTRACT: Using the field distributions of appropriate models which closely approximate the geometric shapes of some typical magnetic lenses, the flux density along the surface of a magnetic cir cuit, the flux entering it and hence the flux density at different positions within the magnetic circuit can be calculated. The resulting expressions are simple and easy to use. Special attention is paid to the crucial parts of the magnetic circuit, such as the pole pieces and the bottom part of the iron core. This sort of calculation was applied to the design of the objectives of our transmission electron microscope DX-4 and the scanning electron microscope DX-3A. The error in the prediction of flux density within the magnetic circuit was found to be less than 20 percent. The method discussed in this paper can thus be used as an approximate but quick way of designing a magnetic circuit if a certain safety factor is taken into account.

AUTHOR: LE Zhongdao [2867 0022 6670]
JIN Shengjing [6855 5110 4842]
LIU Renyan [0491 0086 1750]

ORG: All of Changchun Institute of Physics

TITLE: "A Precise Collimation Design of the Electrical Part in Photo-transit"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 35-49

TEXT OF ENGLISH ABSTRACT: If the telescope in a transit is replaced by a photo-collimator, it is called "photo-transit." It is the main collimation equipment in missile transmitting fields. This paper introduces the theory and practice of precise collimation design of the electrical part in photo-transit. Photo-transformation circuit of the narrow-gap vibration is the center of the precise collimation design. We analyze it theoretically and propose the optimal design approach. The vibrator is a very important element in narrow-gap vibration. Its design principles, practices and installations are given. The azimuthal resolution of precise circuit is 0.5 seconds under the condition of 15M distance between photo-transit and the mirror.

AUTHOR: FENG Guonan [7458 0948 2809]

ORG: Beijing Polytechnic University

TITLE: "The Analysis of the Effects of Dry Friction on Low-speed Performance of Servo System"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 50-57

TEXT OF ENGLISH ABSTRACT: How to improve low-speed performance of servo systems is one of the important subjects confronting system designers. There are many factors affecting low-speed performance, one of which is the static and kinetic dry friction in the actuator. The main effect of dry friction on the motion of a servo system is that it causes unsteady motion of the drive shaft at low speed. In this paper, response of a typical DC servo system with static and kinetic dry friction to ramp input has been analyzed by means of piecewise-linear and state-variable methods. The system includes a position feedback, a rate feedback and a PI cascade compensator. Both effects of static and kinetic dry friction on low-speed performance of servo system and how to modify it are discussed.

AUTHOR: DU Zhihui [2629 1807 6540]

ORG: Shanghai Xinyue Instrument Factory

TITLE: "Determination of Optical Parameters in Designing a Scanning System for Thermal Imaging Purposes"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 58-64

TEXT OF ENGLISH ABSTRACT: This paper describes the derivation of some equations in accordance with the principle of scanning movement of a polyhedral mirror drum. The equations are the relationship between circumcircle radius of the drum, effective aperture of objective lens, relative position of the optical axis of objective lens with the rotating center of the drum, and effective scanning angle of the drum on each side. For straightforwardness eight illustrative graphs are given. Another equation according to the principle of plane mirror imaging is introduced also. It derives the scanning locus equation for detector image on the objective plane.

AUTHOR: ZHANG Shanzhong [1728 0810 6945]
PU Zhaobang [3184 2507 6721]

ORG: All of Harbin Institute of Technology

TITLE: "The Harmonious Analysis Method for Estimation of Grating Signal Quality"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 65-71

TEXT OF ENGLISH ABSTRACT: This paper gives a harmonious analysis method for the estimation of grating signal quality. The whole data of all quality indices of grating signals may be obtained by this method in one measurement. The measuring data are treated by an electronic computer with BASIC language programming.

AUTHOR: CHEN Geng [7115 1649]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "A Discussion of Output Spectra of DELTIC and Compressed-time Correlator"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 72-81

TEXT OF ENGLISH ABSTRACT: In this paper the output spectra of DELTIC and compressed time correlator can be expressed by means of delay theorem and principle of sampling oscillogram. The expression may be useful in engineering design of the correlator which may be applied to spectral analysis and signal detection.

AUTHOR: WANG Junde [3769 0193 1795]
YAO Rongyu [1202 2837 0151]
LI Jingzhi [2621 2529 5347]
et al.

ORG: All of Dalian Institute of Chemical Physics, Chinese Academy of Sciences

TITLE: "Development of Smallbore High Efficiency Column with a New Chemically Bonded Alkyl Stationary Phase"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 82-89

TEXT OF ENGLISH ABSTRACT: A smallbore chemically bonded alkyl stationary phase column of 2 mm ID and 15 cm in length, having an efficiency of 6400~7600 theoretical plates, has been developed. The column efficiency is nearly the same as that of the routine analytical column of 4.6~5.0 mm ID. The amount of eluent used for the smallbore column, however, is less than about one-fifth that of the ordinary column. Using the reaction of monochlorosilane with 5 μm accumulated silica bead instead of trichlorosilane and irregular silica gel, we prepared a nonpolar chemically bonded phase packing which has a higher carbon content and more obvious hydrophobicity. Moreover, the reproducibility of the preparation is better. The equipment and assembly necessary for getting high efficiency with the smallbore column is discussed briefly. By use of Model SW-1 smallbore column HPLC instrument with the Model K-1 column fittings and injector, the detector with small cell

[Continuation of YIQI YIBIAO XUEBAO No 3, 1981 pp 82-89]

volume and the pump delivering solvent at low flow rate, satisfactory results have been obtained. Some examples of application are shown in the paper.

AUTHOR: JIE Bingxin [2263 4426 0207]

ORG: Huazhong Institute of Technology

TITLE: "Another Equivalent Transformer Circuit--A Theoretical Analysis Method for Transformer Bridge"

SOURCE: Beijing YIQI YIBIAO XUEBAO [CHINESE JOURNAL OF SCIENTIFIC INSTRUMENT] in Chinese No 3, 1981 pp 90-96

TEXT OF ENGLISH ABSTRACT: In this paper, according to the fundamental principle of transformers, a more reasonable equivalent mutual circuit is proposed. The equivalent circuit considers the magnetic association between each winding as well as the core loss. It is an accurate analysis method. Finally, the concept of equivalent circuit is adopted to analyze ordinary transformer of two or three windings, with valuable results. Although the equivalent circuit is derived from analysis of the transformer bridge, it is suitable for analysis of the transformer in other cases with more strict requirements.

9717
CSO: 4009/11

AUTHOR: ZHANG Xin [1728 9515]
et al.

ORG: Shanghai Textile Sciences Research Institute; et al.

TITLE: "Air-jet Loom with Profiled Reeds"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 7-11,16

TEXT OF ENGLISH ABSTRACT: This article deals with experiments and analysis of the air current distribution, air pressure and the speed of the air stream through the weft insertion race in relation to the weft flying in the weft insertion system using relay principle. Thus, main rational construction data and technology parameters are obtained. Through practical running, the air jet loom with the above investigation results proves able to achieve an actual weft insertion rate of 816 m/min for the reed width of 2.4 m.

AUTHOR: SHEN Ganqing [3088 3227 3237]
SUN Kai [1327 6963]

ORG: Both of the Huadong Institute of Textile Technology

TITLE: "A Study of the Reaction of Cellulose Fibers to DMEU"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 25-33

TEXT OF ENGLISH ABSTRACT: From experiments on the anti-crease finishing of cotton and rayon fabrics with DMEU the main conclusions are obtained as follows:
(1) Under the present curing conditions, both the rate of fixation and that of covalent cross-linking onto the cellulose are proportional to the concentration of DMEU in formulations, but not related to the effective hydroxyl content of the cellulose. In other words, it is a pseudo first order reaction. In consideration of the orientation property of the reaction on fibers, it is possible to consider that, as a whole, the complicated reaction is generally of the first order, and is an oriented and irreversible reaction.
(2) During curing the etherification of cellulose is the prevailing reaction. Raising the curing temperature will increase the fixation of DMEU and improve the cross-linking formation. Under the present experimental conditions activation energy of fixation of DMEU is E=12 Kcal/mol and impact factor A is 6×10^5 min^{-1};

[Continuation of FANGZHI XUEBAO No 4, 1981 pp 25-33]

activation energy of cross-linking development is E=9 Kcal/mol and impact factor A is 6.6 x 10^{-3} min^{-1}.
(3) In the precondensation solution, the increase of the ratio CH_2O/CEU facilitates the developments in cross-linking. In the process, the loss of formaldehyde must be prevented as much as possible, otherwise the density of corss-linking would be lowered and the degree of self-condensation and side-chain would be increased.

AUTHOR: YAN Wene [7051 2429 5501]
WANG Zhihui [3769 1807 6540]

ORG: Both of the Tianjin Institute of Textile Technology

TITLE: "Separation and Preparation of Standard Cyclic Trimer Sample from PET Fiber and Determination of Its UV Extinction Coefficient"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 38-39

TEXT OF ENGLISH ABSTRACT: We have obtained a colorless rhombic single crystal of cyclic trimer by means of a new procedure from dyed and undyed polyester fibers. The crystal size is on a millimeter scale. Using this sample, we have prepared a standard solution and obtained a standard curve for UV analysis. Its extinction coefficient at 240 nm wavelength is $\varepsilon(240\ nm) = 59.34 \times 10^3$ L. Mol^{-1}. cm^{-1}.

AUTHOR: ZHANG Funian [1728 4395 1628]
ZHU Hong [2612 4767]

ORG: Both of the Shanghai Textile Industry Special School

TITLE: "An Analysis of Detaching and Overlapping Processes on Cotton Comber"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 4, 1981 pp 49-54

TEXT OF ENGLISH ABSTRACT: Based on the calculation of the operation curves and the technical characteristics of the detaching rollers on certain cotton combers, both domestic and imported, this paper gives a theoretical analysis of the main parameters of the detaching and overlapping process, as well as the effects of such parameters on the production efficiency, and thus some proper technical parameters of the process on cotton comber are obtained.

9717
CSO: 4009/36 END

JPRS 79380

5 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 135

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79380

5 November 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 135

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Past, Present, Future of Radio, TV in China Reviewed
(Li Feng; DIANZI SHIJIE, No 5, 1981) 1

Self-Induced Polarization Changes of Laser Beam in Glass
(Zhang Meizheng, et al.; JIGUANG, Apr 81) 6

Use of Remote Sensing Technology in Surveying Described
(Jin Hengding; GONGCHENG KANCHA, 22 Nov 81) 12

ABSTRACTS

AGRICULTURAL RESOURCES

ZIRAN ZIYUAN /NATURAL RESOURCES/ No 3, Sep 81 23

BIOCHEMISTRY AND BIOPHYSICS

SHENGWU HUAXUE YU SHENGWU WULI XUEBAO /ACTA BIOCHIMICA ET BIOPHYSICA SINICA/ No 3, Jul 81 25

BIOPHYSCIS

SHENGWU HUAXUE YU SHENGWU WULI JINZHAN /BIOCHEMISTRY AND BIOPHYSICS/ No 4, Aug 81 27

JISUANJI XUEBAO /CHINESE JOURNAL OF COMPUTERS/ No 5, 1981 29

ELECTRIC LOCOMOTIVE

JICHE DIANCHUANDONG /ELECTRIC DRIVE FOR LOCOMOTIVE7 No 3, 1981 34

ELECTRIC POWER

DIANLI XITONG ZIDONGHUA /AUTOMATION OF ELECTRIC POWER SYSTEMS7 No 5, 1981 36

LOADING, UNLOADING MACHINES

QIZHONG YUNSHU JIXIE /HOISTS AND CONVEYANCES7 No 3, 6 Jun 81 38

METALLURYY

YOUSE JINSHU /NONFERROUS METALS7 No 3, Aug 81 40

NATURAL SCIENCES

JILIN DAXUE ZIRAN KEXUE XUEBAO /ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS7 No 3, 20 Aug 81 53

PAST, PRESENT, FUTURE OF RADIO, TV IN CHINA REVIEWED

Beijing DIANZI SHIJIE [ELECTRONIC WORLD] in Chinese No 5 1981 pp 2-4

[Article by Staff Reporter Li Feng [7812 1496]: "The History, Present Situation, and Future of Our Nation's Broadcasting and Television"--Interview With Huang Yun [7806 1496], Deputy Chief Engineer of the Central Television Station]

[Excerpt] We listen to radiobroadcasts and watch television every day, and everyone is interested in the development of broadcasting and television in our nation. Not long ago, on the occasion of the national conference of activists in the popularization of electronic sciences, we visited the deputy chief engineer of the Central Television Station, Comrade Huang Yun, and asked him to talk anout the history, present situation, and future of the development of our nation's radiobroadcasting and television.

Comrade Huang Yun is a permanent member of the Chinese Electronics Society and deputy chief of the popularization committee. When we proposed this topic, he accepted the "task" willingly and enthusiastically acquainted us with the situation.

Historical Retrospect

Comrade Huang Yun is an eyewitness to radiobroadcasting in old China. He was one of the participants in the building of the people's broadcasting business. Thus, when talking anout its history, he told it as if it were a family treasure.

Radiobroadcasting in China began during the 1920's. Inside the telephone station across from the Xidan Market in today's Beijing City, there once was a broadcast station. The power of the transmitter was 100 watts. This radio station, assembled with parts from abroad, was our nation's first broadcast station. At the time, the radio programs consisted mostly of broadcasts of Beijing Opera from theaters. The radios of that time were mostly crystal sets, the volume was low, there was a lot of distortion, and the sound was like the sound of the telephone. At that time there were a few electron tube radios. The electron tube had a head as large as a light bulb. The tube was placed in a wooden box 2 or 3 chi in length, and on top of the box was a big iron speaker with a bent neck. The speaker was as large as a 12-inch table fan, and the quality of the sound was not good. Even so, at that time, being able to sit at home and listen to Beijing Opera was an enjoyment. Some old people would sit for half a day when they turned on the radio. More precious at the time was having a large-speaker electron tube radio. The whole family would gather around the "electronic box," and the scene was even more lively.

In the 1930's, other large cities gradually had their own radiobroadcast stations--there were several in Shanghai alone--but most were small and scattered. Later, the Kuomintang built a broadcast station in Nanjing whose power was said to be "the greatest in the Far East." The power was 75 kilowatts. Because there were no high-power electron tubes, the final output used 18 water-cooled electron tubes.

When we asked him when he became interested in radio, he reminisced: "When I was still an elementary school student, I accidentally came across a magazine that contained an article on how to build a crystal radio set, and I was attracted. I immediately prepared the materials and went to a Chinese medicinal herb shop and spent two copper coins (the money of that time) to buy several peices of 'natural copper' for the detector. When I heard the sound of broadcasts from the crystal set I had made myself, I was so happy I jumped in the air. From then on, radio and I became inseparable." As it turned out, he was also a radio lover.

Xinhua Broadcasting Station

At the beginning of the War of Resistance Against Japan, the liberated areas did not have their own radio stations. The airways of the motherland were filled with the radiowaves of the reactionary propaganda of the enemy and the false government. To spread the truth and break the enemy's monopoly of the radiowaves, the Party Central Committee established the Xinhua Broadcasting Station in northern Shaanxi. On 30 December 1940, it officially began broadcasting with the call letters "XNCR" (X is the international designation for the first letter of Chinese radio stations; the remaining three letters were the abbreviation for New Chinese Radio); the frequency was 7,500 kiloHertz. Although the power was only 200 watts, [the station] served an important function in propagandizing the goals of our armed forces and exposing the schemes of the enemy.

When our conversation reached this point, Comrade Huang Yun told us about the story of Comrade Liu Shanben [0491 0810 2609], who defected from the enemy in a plane. Liu Shanben originally was in the Nationalist Air Force. He listened for a long time to the broadcasts of XNCR, he became enlightened, and under the call of the revolution he flew a large bomber from the region controlled by Chiang Kai-skek and defected to Yan'an, where he was welcomed enthusiastically by our armed forces. Later, Comrade Liu Shanben contributed to the preparations for building our people's air force.

Comrade Huang Yun went on to point out that during the war years, the people's broadcasting activities developed in a situation where equipment was very difficult to come by. Sometimes, to obtain a resistor with a suitable resistance value, many resistors had to be connected serially or in parallel. The antenna was connected to a railroad track. A cave with a blanket was the broadcast studio. Under the care of the Party Central Committee, comrades who were engaged in broadcasting at the time relied on a high degree of revolutionary enthusiasm and a sense of responsibility, and overcame various difficulties. Up to the eve of liberation, broadcast stations were established one after another in the liberated regions in the Northeast, North China, and the Northwest. The largest transmitting power had reached 300 watts.

Development of People's Broadcasting

As the revolution won victories, broadcasting in the areas that had been controlled by the Kuomintang was returned to the people and given new life. As he described the scene of the PLA receiving the Beijing Radio Station from the Kuomintang, Comrade Huang Yun said the transmitting station at Shuangqiao in Dongjiao had not been able to afford to pay the electricity bill and the machines had long since stopped operating. Because there was no coal, there was no heating. The large equipment room had only several guards standing around a small stove shivering in the cold. After entering the town, we quickly reestablished broadcasts and changed the name to the Beiping Xinhua Broadcast Station.

After liberation, as socialist construction developed in our nation, a number of large transmission stations were gradually built. Each province had large power transmitters.

As transistor technology developed, the receivers also developed from electron tube radios to transistorized radios with stable properties and small consumption of electricity. At present, according to incomplete statistics, the nation has a total of over 80 million radios. Annual production is nearly 20 million units, with over 250 varieties.

The other way that our nation's broadcasts have become popular is through cable broadcasting. Powerlines form a huge broadcasting network spanning our nation's territory, connecting the border regions with the heart of the motherland--Beijing. People's broadcasting has served immeasurably in [aiding the] socialist revolution and construction of the motherland and in enriching the people's political and cultural life.

The present Central People's Broadcasting Station has both amplitude modulation broadcasts and frequency modulation broadcasts. In addition, it has worldwide broadcasts in 39 languages under the call sign "Radio Beijing."

Our Nation's Television Broadcasts

The development of broadcasting enabled us to listen to voices from the [various] regions of the world. But as the popular saying goes: "Hearing a hundred times is not as good as seeing once." The people's demands for the transmission of pictures led to the development of television technology.

Research in television technology began before World War II. Later it was interrupted because of the war. After the war, the United States was the first nation to begin television broadcasting, and other nations followed. Japan tested telecasting in 1954.

Preparation for television broadcasting in our nation began in 1956. There was a debate as to whether we should rely on others or develop television ourselves. At the time, one foreign engineer believed that for the Chinese to rely on themselves to develop television, it would take at least 15 years at the earliest. Therefore he suggested that we import full sets of equipment. The 'unselfish helpers" at the time also suggested they they help us design. They said that they would use their own equipment, but that even this would require 5 or 6 years before test telecasting could become a reality. We selected the road of self-reliance, won the final victory ahead of time, and acted proudly for the Chinese people.

The Beijing Broadcast Equipment Plant, Qinghua University, and the Broadcasting Administrative Bureau jointly shouldered the task of trial-manufacturing television equipment. After slightly more than 1 year, we developed our nation's first set of telecasting equipment. On 1 May 1958, the "Beijing Television Station" was born. Afterward, television stations were established one after another in Shanghai and other cities. The largest number of stations had at one time reached over 20, and research in color television technology had also started. It is a pity that the 3 years of economic difficulties and 10 years of unrest hindered the development of our nation's television. Beijing Television Station even stopped telecasting for a period, creating a very bad effect.

In 1973, Beijing Television Station began trial-telecasting in color. After the "gang of four" was smashed, the name was changed to Central Television Station, and another television station was built in Beijing. At present, except in Xizang, television transmission towers cover every province and city in the nation. There are also many relay stations. The programs telecast from the Central Television Station are transmitted to every region of the nation via a microwave trunkline.

While developing transmission technology, we also began the development of television receivers. In 1958 over 200 television sets were produced. In recent years our nation's television receivers have developed greatly. According to estimates, there now are over 6 million television sets throughout the nation, production in 1980 had already reached 2.2 million units, and there are a certain number of color television sets.

The Future of Broadcasting and Television

Discussing our nation's development in radiobroadcasting and television, Comrade Huang Yun believes a very important question is how to expand the area of television coverage so that people throughout the nation can watch television. A second question is how to use advanced technology in broadcast techniques.

Satellite Broadcasting and Television. Because television signals are transmitted by ultrashortwaves, they are limited by the curvature of the earth and can be transmitted only in straight lines of "visual distance"--i.e., even if the television transmitting tower is built very tall, the distance of the transmission can only be up to 100 kilometers. At present, microwave relays are used to transmit programs to the capitals of 28 provinces (cities, and autonomous regions) and to some large and medium cities near trunk lines. Relying on the "line-of-sight" transmission method to realize large area coverage has many difficulties; the basic solution is to establish a satellite television broadcast system. A radio and television broadcast satellite that is synchronous with the earth's rotation can enable [people] anyplace in China to see Central Television Station programs. Three such satellites can realize global relay broadcasts. As long as there is a parabolic surface antenna 60 centimeters in diameter trained on the satellite, direct reception is possible, or the programs can be received by the ground relay station and then relayed to users' receivers.

Talking about this, Comrade Huang Yun also mentioned an interesting "time difference" problem. The time difference between the eastern part and western part of our nation is about 2 hours. For example, 7 pm in Beijing is the "golden time" for watching television but in Urumchi it is still daytime and people have not yet finished the day's work! Therefore, broadcasts to the western regions must be delayed 2 hours to suit local living customs.

"Doesn't the Central Television Station receive television news via satellite now?" Comrade Huang Yun said this segment of programing is received by the Shanghai satellite ground station from a foreign satellite flying over the Pacific. It is then transmitted by microwave relay to Beijing, and the Central Television Station records the images and then rebroadcasts them. Our nation's important television broadcasts are also realized via this system.

Frequency Modulation Stereo Broadcasting. As electrical and audio technology develop and the people's living standards rise, a demand for a higher quality of broadcast sound has emerged. At present, amplitude modulation broadcasts have poor sound quality, there is a lot of noise, and mediumwave frequency stations are crowded. To expand the frequency band, improve the quality of the sound, and increase the ability to resist interference, frequency modulation stereo broadcasting must be developed.

After Comrade Huang Yun had acquainted us with the situation regarding the development of frequency modulation broadcasting, he said the Central Radio Station is preparing for frequency modulation stereo broadcasts. In fact, some local broadcasting stations have already begun test broadcasts in stereo.

9296
CSO: 4008/459

APPLIED SCIENCES

SELF-INDUCED POLARIZATION CHANGES OF LASER BEAM IN GLASS

Shanghai JIGUANG [LASER] in Chinese Vol 8 No 4, Apr 81 pp 22-24

[Article by Zhang Meizheng [1728 2734 3791], Deng He [6772 0735] and Li Chengfu [2621 2052 1381] of the Shanghai Institute of Optics and Fine Mechanics of the Chinese Academy of Sciences: "Self-Induced Polarization Changes of the 1.06-Micron Laser Beam in Glass"]

[Text] Abstract: We used a TEM_{00} mode neodymium glass laser system and observed changes of self-induced polarization of a laser beam in some optical glass and laser neodymium glass. The experiment measured their nonlinear polarization parameter C_{1221}, and determined their nonlinear refractive coefficient n_2.

I. Introduction

The nonlinear effect of strong lasers and transparent media can cause the optical properties of materials to change. Of the changes, the main one is the nonlinear change of the refractive coefficient of the material:

$$n_0 = n_2 + n E^2/2, \quad (1)$$

where n_0 is the linear refraction of the material, E is the vector of the electric field of the light wave, and n_2 is the nonlinear refractive coefficient. The nonlinear change of this type of material conversely affects the light beam itself, causing a lot of self-induced reactions of light. Self-induced polarization change (SIPC) is very important among the self-induced reactions.(1, 2).

In 1972, Owyoung et al used a single mode ruby laser and measured the SIPC(3,4) of some glass and crystals (YAG), and obtained a precision of about 10 percent. This is at present the most accurate report concerning the values of n_2. Here we have introduced the experimental results using a 1.06-micrometer single mode laser.

II. Principle

A quasi-monochromatic elliptically polarized light can be composed of a "positive" and a "negative" circular polarized light, i.e.:

This article was received on 14 January 1980.

$$E = A_+ e^{i\psi} e_+ + A_-\hat{e}_- \qquad (1)$$

where ψ is the initial phase difference between the positive and negative circular polarized components. Its third order nonlinear polarization in an isotropic medium can be written as:

$$P_+^{(3)} = \left\{6C_{1122}\,(A_+^2 + A_-^2) + 6C_{1221}\,A_-^2\right\}\,A_+\,e^{i\psi} \qquad (2)$$

$$P_-^{(3)} = \left\{6C_{1122}\,(A_+^2 + A_-^2) + 6C_{1221}\,A_+^2\right\}\,A_- \qquad (3)$$

The variations of their nonlinear refraction produced in the medium are:

$$\delta n_+ = \frac{12\pi}{n_o}\,[C_{1122}(A_+^2 + A_-^2) + C_{1221}\,A^2] \qquad (4)$$

$$\delta n- = \frac{12\pi}{n_o}\,[C_{1122}\,(A_+^2 + A_-^2) + C_{1221}\,A_+^2 \qquad (5)$$

We can see from equations (4) and (5) that under elliptic polarization, the variations of refraction caused by the positive circular polarized light and the negative circular polarized light are not equal (because $A_+ \neq A_-$). The phase difference generated between them is:

$$\delta = \frac{w}{c}\,\frac{12\pi}{n_o}\,C_{1221}\,(A_-^2 - A_+^2)z \qquad (6)$$

where z is the distance of propagation of the light beam in the medium. Because of the phase difference δ between the positive and the negative circular polarized light when the beam of light exits the medium, the main axis of the polarized ellipse rotates an angle θ at z:

$$\theta = \frac{1}{2}\,\delta = \frac{6\pi w}{n_o c}\,C_{1221}\,(A_-^2 - A_+^2)\,z \qquad (7)$$

Using the average power density of the light beam to represent the above, we have:

$$\theta = \frac{48\pi^2 w}{n_o^2 c^2}\,C_{1221}\,P_z \cos 2\phi \qquad (8)$$

where $P = \frac{cn_o}{8\pi}E^2$; $E^2 = A_+^2 + A_-^2$, the intensity of the total electrical field of the light wave; $\mathrm{tg}\,\phi = A_+/A_-$. Equation (8) shows that after a strong elliptically polarized laser passes through a medium, the angle θ of rotation of its polarized ellipse and the power density P of the light beam, the length of the medium z, and the nonlinear polarization parameter C_{1221} are proportional. We only need to measure the relationship between the angle θ of rotation of the polarized ellipse and the power density of light to obtain the nonlinear polarization parameter C_{1221} from equation (8) and the nonlinear refractive coefficient n_2 under distortion of the pure electron:

$$n_2 = \frac{36\pi}{n_o} C_{1221} \tag{9}$$

III. Experimental Installation and Method

We used a TEM_{00} mode neodymium glass laser system (first magnitude oscillator and third magnitude amplifier). The resonance cavity of the oscillator was a stable planar-spherical cavity, the length of the cavity was 137 centimeters. We used a KDP crystal as the Q switch. The width of the semipolar value of the laser pulse was 100 millimicroseconds. Inside the cavity we added a $\phi 2$ aperture that selected a single transverse mode. The laser output from the oscillator passed through the third magnitude neodymium glass amplifier and was amplified. The total output energy could reach above 6 joules, the diameter of the light beam was about $\phi 8$. The experimental installation is illustrated in Figure 1. The laser beam output by the laser system passed through a long focal length lens (f = 3.5 meters) and entered a Rochon polarizing prism P_1. The Fresnel rhomb R_1 caused the incident linear polarized light to become an elliptically polarized light (the incident plane and the direction of polarization of the laser in R_1 formed a 22.5° angle). The sample was placed behind the focal point of the lens L to obtain the appropriate diameter of the light beam. The direction of the second Fresnel rhomb R_2 was parallel to R_1, and when rotation of the polarized ellipse did not occur, the elliptically polarized light became a linear polarized light. We adjusted the direction of the Rochon polarizing prism P_2 so that the output o light was the smallest and the e light was the largest. The energy detectors C_1, C_2, C_3 respectively measured the total input energy, the o light energy and the e light energy. When the strong light beam passed through the sample, the polarized ellipse rotated. This was manifested by an increase in the signal in the direction of the o light. The ratio of the power P_o of the light measured in that direction and the total power P of light entering the sample is F:

$$F = \frac{P_o}{P} = \frac{e_o}{e} \tag{10}$$

where e_o e are the corresponding energies measured. This ratio and the angle of rotation of the polarized ellipse have the following relationship:

$$F = (\sin 2\phi \ \sin\theta)^2 \tag{11}$$

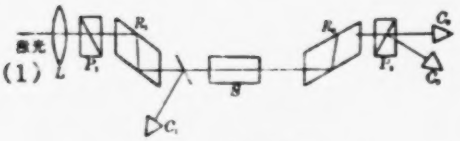


图1 实验装置图

L—透镜(f=3.5米); P_1、P_2—洛匈棱镜; R_1、R_2—菲涅尔菱体; S—待测样品; C_1、C_2、C_3—能量检测器

Figure 1. Illustration of the experimental installation.

Key:
1. Laser
L. Lens (f = 3.5 meters); P_1,P_2 - Rochon polarizing prism; R_1, R_2 - Fresnel rhomb; S - sample to be tested; C_1, C_2, C_3 - energy detector.

Table 1. Nonlinear Polarization Coefficnets and Nonlinear Refractive Coefficients n_2 of Various Types of Glass

(1) 玻璃牌号	$n_{1.06}$	(2) θ (功率为500兆瓦/厘米²)	C_{1221} (10^{-15}esu)	n_2(10^{-13}esu)		
				(3) 实验值		(6) 计算值[6]
				(4) SIPC法 (线偏光)	(5) 自聚焦法[5] (自然光)	
BaF-2	1.5567	3°24'	4.12	3.0	4.1±0.4	3.6
ZF-2	1.6510	5°13'	7.26	5.0	2.7±1.1*	5.5
ZF-7	1.7746	7°31'	11.77	7.5	6.4±1.1	9.0
N_{0312}	1.5115	2°18'	2.62	2.0	1.9±0.4	1.8
N_{1012}	1.5079	2°10'	2.45	1.8	1.6±0.5	1.9
[illegible]21-25	1.5744	2°11'	2.72	2.0	1.3±0.3	1.5
[illegible]	1.530	2°03'	2.44	1.6		1.1

(7) [illegible]测量时，材料的光学质量不好，数据偏低

Key:
1. Label of glass
2. (Power is 500 megawatt/centimeter^2)
3. Experimental value
4. SIPC method (linearly polarized light)
5. Self-focusing method (5) (natural light)
6. Calculated value (6)
7. *At the time of taking measurements, the optical quality of the material was not good and the data are lower

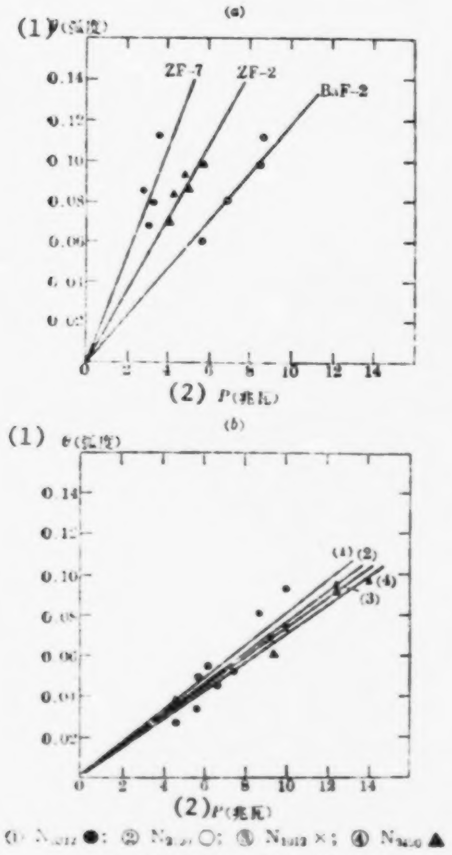


图2 自感生偏转角与激光功率的关系

Figure 2. The relationship between the angle of rotation of self-induced polarization and the power of the laser.

Key:
1. (Radian)
2. P (megawatt)

IV. Results and Discussion

We tested and observed some optical glass (BaF-2, ZF-2, ZF-7), neodymium silicate glass (N_{0312}, N_{1012}) and neodymium phosphate glass (N_{2120}, N_{2420}). In the installation shown in Figure 1, when the sample was not placed in it, the measured F was very slight. This showed that when a nonlinear effect was not produced, the polarized ellipse of the laser beam did not rotate. When the 10-centimeter-long sample was placed in the path of the light, and as the incident laser energy increased, we could observe that the energy in the direction of the o light gradually increased (i.e., F increased). This showed that the polarized ellipse of the laser rotated more as the power increased. According to equations (10) and (11), we have determined the relationship between the angle of rotation θ of the ellipse of each material and the incident power as shown in Figures 2(a) and (b). According to equations (8) and (9), we determined the nonlinear polarization C_{1221} and the nonlinear refractive coefficient n_2 of the various materials from the slope of the straight line shown in Figure 2. The results of the experiment are listed in Table 1. It can be seen from Figure 2 that the rotation of the polarized ellipse of the laser beam and the power of the laser are proportional. For different materials, the slope of the straight line is different. When the power density was 500 megawatts/centimeter^2, the angles of rotation of the ellipse of the various materials were: ZF-7: 7°31'; ZF-2: 5°13'; BaF-2: 3°24'; the angle of rotation of the ellipse of the various types of neodymium glass was about 2°15'. Table 1 also lists the values(5) of the nonlinear refractive coefficient n_2 measured by us previously using the self-focusing method and the values of n_2 calculated by the empirical formula used in reference 6. It can be seen that these results are basically consistent.

REFERENCES

1. P. D. Maker et al; Phys. Rev. Lett., 1964, 12,507.
2. Deng He [6772 0735]: "Laser," 1980, 7 No 9, 38.
3. A. Owyoung et al; Phys. Rev. B, 1972, 5, 628.
4. A. Owyoung; IEEE J. Q. E., 1973, QE-9, 1064.
5. Deng He [6772 0735], Zhang Meizheng [1728 2734 3791] et al: "Laser," 1979, 6, No 1, 13.
6. Gan Fuxi [1626 4395 3588], Lin Fengying [2651 7685 5391]: "Laser," 1979, 6, No 4, 12.

9296
CSO: 8111/1878

USE OF REMOTE SENSING TECHNOLOGY IN SURVEYING DESCRIBED

Beijing GONGCHENG KANCHA [ENGINEERING SURVEYING] in Chinese No 6, 22 Nov 80 pp 42-46

[Article by Jin Hengding [6855 0077 0002] of the Tianjin Surveying and Design Academy of the Ministry of Water Conservancy: "Application of Remote Sensing Technology in Engineering Surveying"]

[Text] I. Brief Introduction to Remote Sensing Technology

Remote sensing technology is based on the theory of electromagnetic waves. It does not come directly into contact with the subject of observation. It is a scientific method of understanding the existence, properties and scale of the observed objects from a high altitude or from a remote distance via sensors. A remote sensing system has five components: transport, sensors, ground receiving stations, image processing, and image interpretation.

Remote sensing is characterized by high speed gathering of a large range of data. Since the 1960's, it has developed rapidly. At present, there are 75 nations and 79 professions that utilize remote sensing technology, thereby greatly conserving the time and cost of field work, overcoming rain in the tropics, high mountains and steep cliffs, and difficulties in transportation. It has enabled the gathering of data which was difficult to obtain by traditional surveying methods.

Based on differences in the means of transport, remote sensing technology can be divided into three main categories: remote sensing in space, aeronautical remote sensing, and ground remote sensing.

The following six methods of remote sensing technology are used in engineering and geological surveying:

1. Visible light remote sensing. This includes black and white photography and color photography utilizing the light waves of visible light in the spectrum. The sensor is a channel of wavelengths between 0.40 and 0.76 microns.

2. Multiple wavelength remote sensing. Within the range of the spectrum from visible light to infrared, many narrow wavelengths are utilized for simultaneous photography. The sensor has a multitude of channels--a maximum of 13. At present, the range of wavelengths utilized is from 0.41 to 14 microns. Based

on the difference in the method of image formation, remote sensing can be further divided into three methods: multiple wavelength scanning, multiple wavelength photography and multiple channel television imaging.

3. Infrared remote sensing. This is the method of using the infrared rays of the spectrum for remote sensing. According to the different methods of imaging, this can be further divided into infrared scanning, black and white infrared photography, and color infrared photography. The wavelengths used by the sensor at present are between 0.70 and 14 microns.

4. Microwave remote sensing. This remote sensing method is divided into two types based on whether there is an emitting source or not: passive (without an emitting source) microwave remote sensing with a microwave radiometer as its sensor; and active (with an emitting source) microwave remote sensing with the microwave scattering meter, microwave altimeter, microwave imaging radar and microwave holographic radar as its sensors. The aerial sideview radar is an aerial remote sensing method developed on the basis of the imaging radar. Its operating frequency generally utilizes the X band (2.7 to 5.8 centimeters) and the K band (0.83 to 2.7 centimeters). The microwave has a definite ability to penetrate geological bodies, and its depth of influence is equivalent to about 20 times its wavelength. Sideview radar can penetrate heavy fog, trees and coatings. The use of the composite aperture sideview radar of multiple frequencies and multiple polarization enables us to understand the anisotropism of geological bodies and recognize geological bodies, tectonics and to find underground water. The sideview radar tube on the Apollo 17 spacecraft surveyed areas 10 to 1,300 meters beneath the surface of the moon.

5. Laser remote sensing is also called laser radar. The operating wavelengths of its sensors are from visible light to the near infrared range of the spectrum. At present, a laser sectional surveying and cartographic device, a laser altimeter, and a laser rangefinder are available. Laser remote sensing has many applications in the measuring profession.

6. Ultraviolet remote sensing. The sensor's operating wavelengths are in the ultraviolet range. The wavelengths presently utilized are between 0.28 and 0.40 microns. Based on the different methods of imaging, this can be further divided into ultraviolet photography, ultraviolet scanning and ultraviolet television imaging.

Of the methods discussed above, the first four remote sensing methods are the most popularly used. In the future, as remote sensing technology develops, more sensors and remote sensing methods will emerge.

II. Remote Sensing Images

Remote sensing images are the data resulting from remote sensing work. There are many varieties. The images are formed by processing and copying information obtained by the sensor onto magnetic tape or film. In general, there are the following types of images:

1. Photographic image. This type of image produced by remote sensing directly reflects the characteristics of surface features, i.e., ordinary photographs such as satellite photographs, aerial photographs, and land photographs. The difference between such photographic images and ordinary photographs is that they utilize different ranges of electromagnetic waves in the spectrum, thus expanding the range of view and reflecting more surface features and properties. For example, the image of temperature differences reflected in an infrared image is not found in ordinary photographs. Photographic images are of two types, black and white images and color images.

2. Composite image. This is produced by images of remote sensing from more than two types of frequency channels, showing the advantages of each and better reflecting surface features, such as false color images and composite false color images produced by multiple wavelength imaging and sideview radar imaging.

3. Separate image. This is an image separated into different levels according to chromatic levels or the scale of greys from the image obtained by the sensor based on working needs, such as a separate density image or an image of filtered waves in space obtained by the use of polarization techniques. The former is frequently used to differentiate lithological characteristics, distribution of minerals and for finding the corresponding area. The latter is helpful in tectonic analysis.

4. Digital image. This can be divided into two kinds: one involves the use of numbers to represent the information obtained, such as microwave digital images, and the other is the image obtained from the computer by automatic recognition of photographic images.

5. Symbolic image. This is an image obtained from the computer by automatic recognition of photographic images.

Under certain conditions, each of the five types of images described above can be transformed from one to another. These images are all useful in engineering, geological and hydrogeological interpretation. At present, because of limited conditions, generally black and white pictures and color images are used the most.

The difference in the means of transport directly reflects the distance between the sensor and the target object. The practical significance is related to the size of the scale and the resolution. For example, the smallest scale of an image produced by space remote sensing is 1:18,000,000, the ground resolution of the corresponding image is 2 kilometers. The scale of the satellite image of Landsat is 1:3,300,000, the ground resolution is 70 meters. The satellite image of the exploratory satellite Pegasus I has a ground resolution of 0.3 meters. The scale of images produced by aerial remote sensing is 1:10,000 to 1:50,000, and it can be magnified to 1:2,000 or 1:5,000. The scale of images in ground remote sensing is generally less than 1:5,000 and the resolution is greater.

The scale of images in remote sensing indicates that aerial and ground remote sensing have greater significance in engineering and geological surveying and hydrogeological surveying. They can be used at different stages and for different purposes in engineering and geological and hydrogeological surveying.

III. Interpretation of Remote Sensing Images

Interpretation of remote sensing images is the final goal of application of remote sensing technology. Because remote sensing can obtain massive amounts of information, the image data can be used by various professions, so it has the characteristic "one remote sensing operation can serve many uses." The quality of the resulting interpretation is determined by the professional knowhow of the workers and the level of knowledge of remote sensing. The process of changing information from remote sensing images into geological data is geological interpretation. The methods of interpretation include ordinary observational interpretation, electronic and optical interpretation and computer interpretation. Regardless of which method is used, related information must be utilized before the goal of interpretation can be achieved. This type of related information in ordinary observational interpretation is called interpretative signs. Frequently used geological interpretative signs are color, shape, size, shade and related bodies. Linear and circular elements in satellite images have great use in the interpretation of geological tectonics and lithological characteristics.

Interpretation of separate density images, digital images and symbolic images includes not only the content shown in the image and its representative meaning: often, the result of interpretation are better when photographic images are used in combination.

IV. Brief Description of the Application of Remote Sensing Technology Abroad

There are already many examples of application of remote sensing techniques in engineering and geological surveying abroad. For example:

1. The Philippines used four types of remote sensing data--aerial sideview radar measurements, color and black and white aerial photography, infrared aerial photography (used for studying the coastal regions) and the multiple wavelength images of Landsat (used to study regional geological tectonics)--in selecting the site for the country's first nuclear power plant. After combined indoor interpretation and field surveys, the various requirements for the selection and the design of the nuclear power plant site were satisfied.

2. During the mid-1960's, Brazil planned to develop the hydrological resources in the northeastern region, for which it used aerial photography, aerial sight measurements and physical probes, and it was able to conduct a comprehensive study of 110 square kilometers of the planned region; 2,800 kilometers of river segments and 231 preliminary dam sites were found. After comparison, 19 dam sites that had good natural conditions and a low unit cost were selected as targets for near term development.

3. In the mid-1960's, during the geological surveying for Butler Dam and the Blue Lake construction project, the United States used five kinds of remote sensing methods--black and white and color aerial photography, infrared scanning, aerial multiple wavelength remote sensing, aerial sideview radar and Landsat's multiple wavelength images--and studied and solved a series of geological problems:

1) The lithological nature and geological and tectonic characteristics of the foundation of the dam, the dam shoulder, the spillway, flood relief projects, reservoir area, road detours and power lines;

2) Stability of the rock body of the side slopes of the banks of the reservoir;

3) Distribution and distances of regional faults and shear zones;

4) Regional seismic and geological data;

5) Survey of building materials;

6) Physical and geological phenomena, such as mountain creep and devolutions.

Cases of using remote sensing technology in engineering and geological surveying of dam sites also include the Buzangle [phonetic] Dam in France, Switzerland's Oberland dam sites and the Goscheneralp Dam site and Iran's Middle East dam site. It is believed that color aerial photographic images have more visible tonal contract, which facilitates the direct drawing of various geological maps. Color infrared photographic images can show the conditions of weathering and can clearly indicate large areas of the ground surface layer containing large amounts of water. In the Buzangle [phonetic] region, a fault zone was discovered. This could not be seen at all in black and white photographs. Heat probe images can reflect the lithological nature and fragmentation zone of a fault and hydrogeological phenomena according to the changes in thermal radiation. A definite relationship exists between the intensity of radiation and the modulus of elasticity, water content, and degree of weathering. At the Middle East dam site, the point of intersection of the rift system and the position of springs and karst caverns were shown. Therefore, it is believed that these three types of remote sensing images are especially useful in engineering and geological surveying.

4. In engineering and geological surveying to select roads through tunnels and tunnel sites, Japan used aerial remote sensing technology and obtained definite achievements. It is believed that the following geological problems can be clarified with the use of such technology:

1) Rock formation (horizontal, inclined, vertical, inverted, buried);

2) Thickness of a single stratum of rock layer, stratigraphic order of the rock strata;

3) Rock body structure (massive, bedded, schistose);

4) Land form and geomorphological types and characteristics;

5) Hardness of rocks;

6) Mineral content of rocks, especially the content of harmful minerals;

7) Internal structure of rocks, compactness, porosity, development of crevasses;

8) Weathering and fragmentation of rocks (such as faults, cleavage, fragmented zones, weathering, mylonitization, kaolinization);

9) Water sources at the construction site and in surrounding areas;

10) Physical and geological phenonema, especially the possibility of buildings and mouths of tunnels being damaged by mountain creep, landslide, devolution, avalanche.

5. Japan's Nakawata Reservoir is located in a sandstone and sandy slate region of the Permocarboniferous system. There is a regional fault passing through nearby, the rocks are fragmented, mountain creep has developed widely, and for this reason, color aerial photographs covering 400 square kilometers were taken and interpretation of remote sensing images and ground surveying was carried out. A total of 419 devolved dikes higher than 20 meters were discovered; the largest landslide among them was as much as 2 million cubic meters.

6. The mountain creep of the Osaka-Fukame-Sanse area was observed dynamically using aerial remote sensing methods. From 21 February 1967 to 22 June 1968, aerial photographs were taken during 11 flights, on the average of once each month, at a flying altitude of 800 meters, and the scale of the images was 1:5,500. Fixed signposts were not set up on the ground; instead, eaves of buildings, corners of stone walls, roots of trees and such fixed surface features at 460 points were utilized. The images were interpreted and it was concluded that during the most violent moment of creeping, the speed of movement reached 20 to 25 centimeters/day, reflecting the sliding movement of the mountain creep.

7. P. Vincent et al of the Ann Arbor Geological Spectrum Company of the United States took our nation's Xingtai Prefecture as an example to explore the use of remote sensing images to study the relationship between linear traces and seismic centers of earthquakes, and they found that a good coorelation exists between the density of the seismic center and the density of the lengths of directional rifts. They believe this model may be useful in pointing out the danger zone of highly violent earthquakes.

8. Great Britain and Canada, utilizing remote sensing technology in surveying underground water, believe the following data can be obtained.

1) Prediction of the existence of underground water, judging the type of water-containing strata of a region and estimating the possible amount of well water;

2) Mapping the strata containing alluvial water according to vegetation maps;

3) Estimating the equivalent amount of water from the accumulation of snow during winter, and from this, estimating the future amount of flow in rivers and the replenishment of underground water;

4) Predicting the need for water for irrigation according to the planting area of crops, and from this, estimating changes in the amount of underground water drawn;

5) Judging water seepage, vadose and underground water level of shallow strata on the basis of the distribution of hydrophilous plants;

6) Judging the position of the center of replenishment and the distribution of seasonal lakes;

7) Monitoring the development of urban construction and forecasting future problems concerning underground water;

8) Studying the hydrological significance of regional topography and geological structure;

9) Judging the sources of acidic water pollution on the basis of the development of open cast mines and monitoring land reclamation;

10) Surveying and mapping faults and joints of hard rock regions, and thus finding rich concentration zones of underground water;

11) Surveying and mapping circular topography that may affect the amount of partially underground water.

V. The Use of Remote Sensing Technology in Our Nation

Remote sensing data are gradually being used in domestic engineering and geological surveying. For example, surveying for selection of factory sites and for water supplies in Yunnan, Henan, Guangdong, Shanxi provinces; investigation of karst seepage in reservoirs in Yunnan, Guizhou, Guangxi and Qinghai provinces; investigation and study of induced earthquakes at the Xinfengjiang Reservoir in Guangdong and the Danjiangkou Reservoir in Hubei; surveying for railroad line selection, tunnels, bridges; general survey of underground water in Shanxi and Nei Monggol; surveying of underground water in shallow strata in the Tianjin area; investigation and research on liquefaction during the Tangshan earthquake, etc., have all used interpretation of remote sensing images in varying degrees. Based on understanding, during engineering and geological surveying, the use of remote sensing techniques in investigating the following problems has been beneficial:

1. Distribution, scale, nature and type of topography and geomorphology of construction zones;

2. Distribution of transportation and traffic lines and residential points in construction zones;

3. Distribution, occurrence, structure and nature of ground surface rocks;

4. Distribution, scale and nature of folds, faults, crevasses, and reflection of partially hidden tectonics;

5. Distribution, scale and nature of physical and geological phenomena such as mountain creep and devolution;

6. Surveying for entrances and exits of tunnels and side slopes of cuttings;

7. Surveying the stability, submergence, seepage and runoff from banks of reservoirs;

8. Surveying the development of karst and related engineering and geological problems;

9. Surveys of construction materials.

VI. Actual Cases of Construction

Because of the need to study the problem of induced earthquakes at the Panjiakou Reservoir and to develop aerial remote sensing experiments, we utilized the American Landsat II satellite's multiple wavelength remote sensing images taken on 23 October 1975 and 25 October 1976, and false color composite images in combination with field survey data to carry out geological interpretation, and we obtained the following results:

1. Lithological characteristics and their distribution. From the pictures, we interpreted the distribution of the various rocks of gneiss, silicarenite, limestone, sandy shale, volcanic rock, granite and loess and accumulation at the foot of mountains (see Figure 1).

2. We analyzed and proved the existence of the two large tectonic belts crossing the reservoir, their distribution, their joining and the distribution and positions of rifts (see Figures 1 and 2).

3. Based on the interpretation of remote sensing images and analysis of regional data, we have formed the following views: 1) the two large tectonic belts have all undergone violent tectonic movements during geological periods; 2) the Yanzigu-Longjingguan rift belt has cut the Xinglong-Xifengkou rift belt and they have been rejoined in juxtaposition; 3) three tectonic stress fields—one extending east-west, one extending north-east, and one of arc-shaped tectonics—exist in the region of the Panjiakou Reservoir; 4) the two large tectonic belts, extending east-west and north-east, both have earthquake-bearing tectonic backgrounds; 5) Xifengkou, Longjingguan, Yanzigu (the Panjiakou Reservoir is situation among them) are regions where earthquakes most easily occur. The possibility of the reservoir inducing the occurrence of earthquakes after the reservoir stores water is very great, and this should be noted.

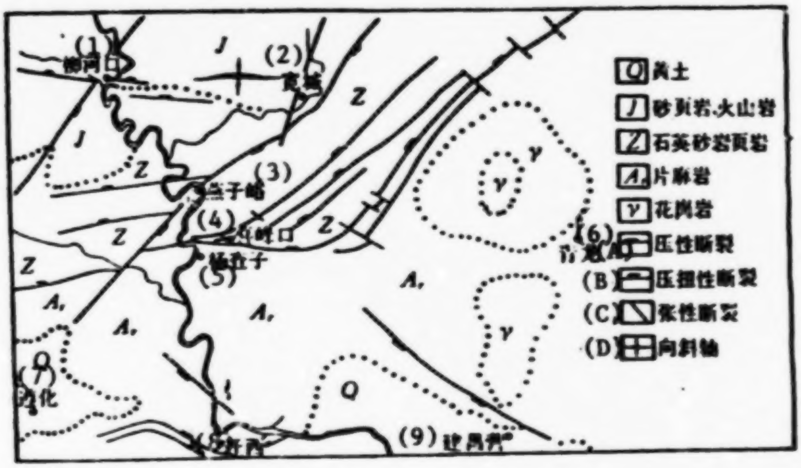

(1) 柳河口
J
(2) 宽城
Z
J
Z
(3) 燕子峪
(4) 喜峰口
Z
Z
(5) 杨岔子
Z
A,
A,
A,
A,
γ
γ
(6) 青龙
γ
Q
(7) 遵化
(8) 迁西
(9) 建昌营
Q 黄土
J 砂页岩.火山岩
Z 石英砂岩页岩
A, 片麻岩
γ 花岗岩
(A) 压性断裂
(B) 压扭性断裂
(C) 张性断裂
(D) 向斜轴

Figure 1. Geological diagram based on interpretation of remote sensing images.

Key:

1. Liuhekou
2. Kuancheng
3. Yanzigu
4. Xifengkou
5. Yangchazi
6. Qinglong
7. Zhunhua
8. Qianxi
9. Jianchangying

Q. Loess
J. Sandy shale, volcanic rock
Z. Silica sandstone shale
Ar. Gneiss
γ. Granite
A. Compressive rift
B. Compressive contorted rift
C. Tensile rift
D. Synclinal axis

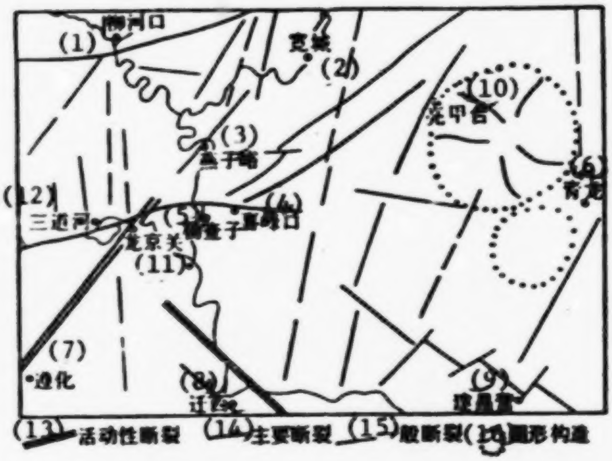

(1) 柳河口
(2) 宽城
(3) 燕子峪
(4) 喜峰口
(5) 杨查子
(6) 青龙
(7) 遵化
(8) 迁西
(9) 建昌营
(10) 亮甲台
(11) 龙井关
(12) 三道河
(13) 活动性断裂
(14) 主要断裂
(15) 一般断裂
(16) 圆形构造

Figure 2. Rift distribution diagram based on interpretation of remote sensing images.

Key:

1. Liuhekou
2. Kuancheng
3. Yanzigu
4. Xifengkou
5. Yangchazi
6. Qinglong
7. Zhunhua
8. Qianxi
9. Jianchangying
10. Liangjiatai
11. Longjingguan
12. Santaohe
13. Active rift
14. Main rift
15. Ordinary rift
16. Circular tectonics

REFERENCES

1. R. G. Reeves: "Manual of Remote Sensing," American Society of Photogrammetry, 1975. Translated by Tang Dingyuan [3282 1353 0337], Chen Ningqiang [7115 1380 6973] et al: "Remote Sensing Handbook," 1st volume, National Defense Industry Press, September 1979.

2. Huang Xun [7806 4821] of the Remote Sensing Applied Research Institute of the Chinese Academy of Sciences: "Introduction to Some of the Activities of the 12th International Conference on Environmental Remote Sensing," August 1978.

3. Surveying Department of the Planning and Design Administrative Bureau of the Ministry of Water Conservancy: "Application of Remote Sensing Techniques in Engineering and Geological Surveying in Water Conservancy," April 1980.

4. Shandong Province Water Conservancy Science Institute: "The Use of Landsat Photography in Underground Water Surveys," 1979.

5. Tianjin-Bohai Aerial Remote Sensing Geological Group of the Planning and Design Administrative Bureau of the Ministry of Water Conservancy: "Geological Interpretation of the Satellite Remote Sensing Images of the Panjiakou Reservoir," January 1980.

9296
CSO: 8111/1876-B

AUTHOR: WANG Yixian [3769 2034 6343]
ZHAO Mingcha [6392 0682 5420]

ORG: Both of Research Institute of Geography, Chinese Academy of Sciences

TITLE: "Spatial Distribution Characteristics of Total Radiation in a Ten-day Interval and Photosynthesis Potential in China"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 32-41

ABSTRACT: Many scientists have studied the subject of total solar radiation distribution in China but their reports are mostly limited to the calculation and distribution characteristic of radiation in a month. These data, therefore, are difficult to satisfy the needs of scientific research and production construction. In agricultural production and experimentation, photoenergy utilization of crops during their period of growth and development and photosynthesis experiments of industrial products, etc. all require total radiation data of ten-day periods or even shorter. This paper discusses the method of computing the total radiation of ten-day periods, the concept and the method of computing photosynthesis potential, the spatial distribution of total radiation in a ten-day period and its relationship to photosynthesis potential, and the tendency of change in time of the total radiation in a ten-day period, and the regionalization theory of photosynthesis potential. Ten-day solar radiation data and the photosynthesis potential of the Northeast, the Inner Mongolia Region, the North China, the Northwest, the Eastern Region, the Region of Sichuan, Yunnan, and Guizhou, and the Qinghai-Xizang Plateau are introduced.

AUTHOR: SU Renqiong [5685 0086 8825]
LU Yazhou [7120 0068 3166]

ORG: Both of Natural Resources Comprehensive Survey Committee, Chinese Academy of Sciences

TITLE: "A Preliminary Study on Irrigation and Drainage Measures of Meadow Reclamation in Heilongjiang Province"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 62-69

ABSTRACT: Meadow reclamation discussed in the paper includes the 4 types of lake shores, vicinity of springs, banks of large rivers and streams, and valleys of small streams. Soils of these areas are thick and highly fertile. After reclamation, cultivation, drying, and maturation, the unit yield of these lands is generally 30 percent above slope lands, and doubling in some cases. The fields are flat and the condition of water is good and the only remaining problems are drainage and irrigation. Reasons for water accumulation of these lands and proper drainage measures are discussed. With successful drainage, irrigation during arid periods becomes necessary, of course. The construction of reservoirs and/or wells are discussed and recommended.

AUTHOR: KANG Qingyu [1660 1987 4416]
ZHONG Lieyuan [6945 3525 0337]

ORG: Both of Natural Resources Comprehensive Survey Committee, Chinese Academy of Sciences

TITLE: "The Experience and Lesson in Bringing Hulunbeier Grasslands Under Cultivation"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 70-81

ABSTRACT: Hulunbeier grasslands are located in the western border of the Northeast in China, including the 2 parts of the low western foothills of Daxinganling and the Hulunbeier highland. Originally, the Eastern part is a forest meadow-chernozem zone and the Western part is a semi-arid grassland-chestnut soil zone. After 1958, especially in 1960, a large scale agricultural reclamation project was carried out in the forest border of the eastern part and in the vast highlands of the western part. By the end of 1962, 25 state-operated farms encompassing close to 3 million mu had been established and a sharp contradiction between agriculture and grazing occurred. In 1963, 76 percent of the cultivated fields (2.26 million mu) was re-abandoned to grassland. The communes devoted to animal husbandry have no grain and feed bases, however. In 1972, the 4 banners had to buy 90 million jin of grain and the transportation cost alone was 600 thousand yuan. The bitter lesson of history points out clearly that if large scale reclamation and retreat from cultivation are not carefully planned, there will be a penalty according to natural and economic laws. The paper includes recommendations for resolving the problems of the eastern and the western parts of the region respectively.

AUTHOR: LU Zhiguang [4151 1807 0342]
ZHENG Jianfei [6774 0494 7236]

ORG: Both of Beijing University of Agriculture

TITLE: "Estimation of Precipitation Change Since the Large Scale Reclamation and Cultivation on the Sanjiang Plain"

SOURCE: Dalian ZIRAN ZIYUAN [NATURAL RESOURCES] in Chinese No 3, Sep 81 pp 90-96

ABSTRACT: The vast region of the Sanjiang plain of the Northeast is currently an important base of commercial grains in China. Since the middle 70's, the problem of aridity is becoming more severe every year. To date, about 1/3 of the region is under cultivation. As the marshes are drained and vegetative covers destroyed during reclamation, the area of water surface is reduced to cause the humidity to drop, the temperature differential to enlarge, the wind speed to accelerate, and wind erosion of soil to rise. This paper reports the establishment of a mathematical model for estimating the range of effect of reclamation on precipitation. The results demonstrate that the mean precipitation of Sanjiang plain before reclamation is 589.2 mm/year, and it is 536.9 mm/year after reclamation. Another calculation shows that the precipitation of the cultivated area and that of the uncultivated area of the plain are not obviously different. Analyses of historical data and the background macrometeorology indicate that in Sanjiang plain, the period of the late 70's is determined to be arid by the principle of natural change more than any other factor.

6168
CSO: 4009/46

AUTHOR: JIN Guichang [6855 6311 2490]
WANG Zhenhua [3769 2182 5478]

ORG: JIN of the Institute of Biophysics, Chinese Academy of Sciences, Beijing; WANG of the Computer Center, Chinese Academy of Sciences

TITLE: "Analysis of Walsh Spectra of Stereoscopic Pairs"

SOURCE: Shanghai SHENGWU HUAXUE YU SHENGWU WULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 3, Jul 81 pp 221-227

TEXT OF ENGLISH ABSTRACT: A tilted line composed of regular texture and described by the equation

$$\begin{cases} x^2 + y^2 = 20^2 z^2 \\ y = 0 \qquad\qquad 0 \leq x < 512 \end{cases}$$

was projected to two planes, left and right, to form a stereoscopic pair. Several such stereoscopic pairs with various binocular disparities were transformed into Walsh spectra using Fast Walsh Transform (FWT) on the computer. There are relative shifts in the position of the peaks of two Walsh spectra of each stereoscopic pair. The degree of the relative shifts is proportional to the extent of disparity. The greater the disparity, the further the peaks will shift. The direction of shifts depends on whether the projected plane is close to the proximal end or distal end of the tilted line. The peaks of the spectrum of the plane close to the proximal

[Continuation of SHENGWU HUAXUE YU SHENGWU WULI XUEBAO No 3, Jul 81 pp 221-227]

end are shifted to the higher frequency and those of the plane close to the distal end are shifted to the lower frequency.

The characteristics of the Walsh spectra of the stereoscopic pair by FWT are just the same as those of the spatial frequency spectra obtained by Fast Fourier Transform (FFT). Because the Walsh transform can be operated on a computer more easily than can the Fourier transform and because FWT is faster than FFT, it is suggested that FWT be used instead of FFT if it is desired that stereoscopic pairs be processed.

AUTHOR: YAO Guozheng [1202 0948 2973]

ORG: Institute of Biophysics, Chinese Academy of Sciences, Beijing

TITLE: "An Analysis of Spatial Frequency Spectra of the Stereoscopic Pair"

SOURCE: Shanghai SHENGWU HUAXUE YU SHENGWU WULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese No 3, Jul 81 pp 229-235

TEXT OF ENGLISH ABSTRACT: The spatial filtering method was used to see if there is any dominant frequency band of the stereoscopic pair in depth perception.

The stereoscopic pair of a tilted line was transformed into its spatial frequency spectra using the Fourier transform on a computer. Various components of the spatial frequency spectra were converted back to stereoscopic pairs. The reformed stereoscopic pairs seemed as though they were treated with spatial filtering. Low-pass, high-pass and band-pass filtering tests were performed and the following conclusions have been derived:
1. A stereo perception can be generated by looking at the stereoscopic pair obtained from the inverse transform of a small spectral fraction with the same frequency component of the right and left eyes. This fraction may be selected from any portion of the spectra and occupies only about 10 percent of the whole bandwidth.
2. Because a stereoscopic pair possesses depth information carried by binocular

[Continuation of SHENGWU HUAXUE YU SHENGWU WULI XUEBAO No 3, Jul 81 pp 229-235]

disparity and a stereo perception can still be formed even when a 90 percent fraction has been filtered out, it is suggested that the disparity is distributed among each frequency fraction, i.e., each frequency component contains the disparity.
3. The relative contrast is not important for generating depth perception. A stereo perception can be generated by relative contrast in the range from ∞ to 2 percent.

9717
CSO: 4009/61

Biophysics

AUTHOR: LU Huimin [7120 1920 3046]
WANG Jinzhu [3769 0093 5511]

ORG: Research Institute of Biophysics, Chinese Academy of Sciences

TITLE: "Engineering Modeling of Visual System and Progress in Vision Hypothesis"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 23-27

ABSTRACT: This paper introduces the subject by quoting David Marr, a MIT psychologist, saying in effect that the current neuropsychology and psychophysics are limited to describing the behavior of various cells and other objects of experimentation and do not seek to interpret such behaviors. For the purpose of understanding the information processing mechanism of the visual system and the relationship between its structure and function, aside from carrying out various levels of biological research, therefore, it is necessary to utilize the technique of simulation and modeling, common in engineering work, to regard the system as a black box to study its input and output relationship. Modeling of visual system has promoted the development of spatial image processing technology, the study on the relationship between vision and the human brain, cybernetics, artificial intelligence, etc. in the USA. Studies on this and related subjects by Blakmore, Louis, Sutro, Tallman, Kabrisky, et al, all of the USA, are very briefly introduced. There is no mention of related work in China.

This paper was received for publication on 10 Jul 80.

AUTHOR: LUO Yongzhao [5012 3057 2507]
ZHAN Guoli [2069 0948 0448]

ORG: Both of Shanghai Research Institute of Physiology, Chinese Academy of Sciences

TITLE: "An Electronic Model for Space Characteristic of Concentric Receptive and Image Enhancement Processing"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 28-31

ABSTRACT: Concentric receptive field is a structure of pre-processing the input image by the visual system. This paper reports a simulation and analysis, using electronic models, of the receptive field parameters and the visual image processing effects. This model is also used as the tool for two-dimensional enhancement of images.

This paper was received for publication on 23 Sep 80.

AUTHOR: NIE Yusheng [5119 3768 3932]
SHEN Xun [3088 1852]

ORG: Both of Research Institute of Biophysics, Chinese Academy of Sciences

TITLE: "The Optical System of Kinetic Spectrophotometer"

SOURCE: Beijing SHENGWU HUAXUE YU SHENGWU WULI JINZHAN [BIOCHEMISTRY AND BIOPHYSICS] in Chinese No 4, Aug 81 pp 53-58

ABSTRACT: Based upon understandings gained in the process of studying and making the microsecond kinetic flash photolysis instrument, the authors introduce in the paper the structure design of the optical system of a kinetic spectrophotometer and the major design consideration, which is to increase the information to noise ratio. Major components of the kinetic spectrophotometric system, including the light source, the specimen container, the monochromator and filter, the detector, the diaphragm, and the shutter, are explained. There is also a brief introduction of the various applications of a kinetic spectrophotometer.

This paper was received for publication on 21 Aug 80.

6168
CSO: 4009/51

AUTHOR: LIU Guoheng [0491 0948 3801]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "CZXT-013 and Some Problems in Implementation"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 321-325

TEXT OF ENGLISH ABSTRACT: In this paper, the function and structure of CZXT-013, which is an operating system on the computer 013, are described. Some problems in CZXT-013 design and implementation, such as resource management, process communication, etc., are discussed.

AUTHOR: ZHANG Youla [1728 0327 5198]
JIA Yaomei [6328 5069 2734]

ORG: Both of the Institute of Computer Technology, Chinese Academy of Sciences

TITLE: "CZXT-013: A Hierarchical Operating System"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 326-334

TEXT OF ENGLISH ABSTRACT: CZXT-013 is a batch-processing operating system, capable of handling eight jobs simultaneously. This paper describes the architecture design for the system, i.e., the design objectives and the tools (hierarchy, process and modularity) which are needed to realize the objectives. The kernel primitives and their design considerations are illustrated in detail, and the function of each process, process control and communication are also described. The experiences gained in the course of design are presented at the end.

AUTHOR: CHEN Huaying [7115 5478 3841]
LU Yuzhen [7120 3768 3791]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "The Design of CZXT-013 Job Control Language and the Implementation of Job Control"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 335-343

TEXT OF ENGLISH ABSTRACT: This paper describes a user-oriented job control language, CZXT-013 JCL. The design principle and some specific commands are presented. Some key problems in realizing the CZXT-013 job control, such as event and condition command, information notification and log file, log-out treatment and fault treatment, are discussed. Their processing methods are also given.

AUTHOR: JIN Qijie [6855 0366 2638]
ZHEN Zengzhen [3914 1073 2182]
ZHANG Congmin [1728 5115 2404]

ORG: JIN and ZHEN both of the Ninth Research Institute of Beijing; ZHANG of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "The Job Management in CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 344-351

TEXT OF ENGLISH ABSTRACT: CZXT-013 is a batch-processing oriented operating system which facilitates on-line operations as well. This system permits three types of jobs to run simultaneously. This paper presents the job scheduling scheme of the CZXT-013 system which is realized in three layers. The paper also describes the states of the jobs in different stages from entering to leaving the system, the state transitions, preparations for the job running and ways to handle the jobs in their normal and abnormal departures.

AUTHOR: FAN Benkui [5400 2609 6652]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Management of Virtual Storage in CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 352-360

TEXT OF ENGLISH ABSTRACT: CZXT-013 provides a multiple page virtual storage system. This article presents a management technique of the virtual storage from the point of view of the software. A description is given of how the virtual storage is implemented from the auxiliary storage management, main storage management and page management (page fault handling, page replacement role, etc.).

The efficiency of the virtual storage is discussed and several prime factors that affect the efficiency of the virtual storage are analyzed as well.

AUTHOR: LI Zhichen [2621 1807 5256]
GU Yuqing [7357 3022 3237]
ZHENG Lijun [6774 7787 0689]
ZHAO Wenqin [6392 2429 2953]

ORG: All of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Input/Output Management of CZXT-013"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 361-366

TEXT OF ENGLISH ABSTRACT: Input/output management of CZXT-013 is divided into two parts--logical device management and physical device management. This article describes the considerations and features of logical device, format processing and device management.

AUTHOR: LIU Guoheng [0491 0948 3801]
CAI Chunlei [5591 2504 7191]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "CZXT-013 Testing and Debugging"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 367-371

TEXT OF ENGLISH ABSTRACT: In this paper the relation between the reliability and testing of an operating system is discussed first. Then the testing and debugging project of CZXT-013, the computer 013 operating system with hierarchic structure of processes, is described. Two testing tools, process tester and system monitor, were used in unit testing phase and integration testing phase respectively.

Process tester is a common testing routine for testing process modules. System monitor is a set of output routines attached to the central parts of system control and responsible for the collection of information.

AUTHOR: QU Yanwen [1448 1693 2429]
LI Xin [2621 6580]

ORG: Both of Huabei Institute of Computing Technology

TITLE: "Waveform Algorithm for Logic Simulation--A Process-oriented Logic Simulation Algorithm"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 372-383

TEXT OF ENGLISH ABSTRACT: The current algorithms for logic simulation are event-oriented. A process-oriented, highly time-parallel algorithm, called waveform algorithm, is first presented in this paper. With this algorithm, the efficiency of logic simulation is improved. The formula for a flip-flop is also given.

AUTHOR: ZHOU Xingming [0719 5281 6900]
ZHANG Minxuan [1728 3046 6693]

ORG: Both of Changsha Institute of Technology

TITLE: "A Theoretical Analysis of Reciprocal Iterative Algorithm and a Discussion of Its Schemes"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 384-391

TEXT OF ENGLISH ABSTRACT: This paper investigates the algorithm of reciprocal iteration. A theoretical analysis of the structure and accuracy control of the initial reciprocal approximation table is described, and an economical and simple hardware scheme of the reciprocal table is put forward. A general method for tolerance analysis and accuracy control is introduced to analyze four different schemes of iterative algorithms. Finally, as an example, the design of approximate reciprocal pipeline is given. In this design the number of pipeline stages and the amount of chips are considerably reduced with the aid of the theoretical analysis mentioned above.

AUTHOR: WANG Changqi [3769 7022 1142]
JIN Xiaolong [6855 2556 7893]
LI Meng [6786 5492]

ORG: All of Shanghai Institute of Railway Technology

TITLE: "Complex Disjunctive Decomposition of Incompletely Specified Three-valued Logic Functions"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 5, 1981 pp 392-399

TEXT OF ENGLISH ABSTRACT: In this paper, S. Lee Hight's theory of complex disjunctive decomposition of incompletely specified Boolean functions is extended to the realm of incompletely specified three-valued logic functions. According to different partitions of a set of input variables of the three-valued logic function, the compatibility relations of column (row) vectors of the three-valued logic function can be found. The DON'T CARE (d) conditions are assigned for the first time and it is required for the second time to determine the compatibility relations of the constrained vectors of the three-valued logic function and to assign the d conditions. Therefore, a method is given with which we can find simple disjunctive decompositions and then form complex disjunctive decompositions for the incompletely specified three-valued logic functions.

9717
CSO: 4009/31

AUTHOR: CHEN Mengping [7115 1322 1627]

ORG: Zhuzhou Research Institute of Electric Locomotives

TITLE: "Stacked Rubber Sandwich Test"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 pp 46-48

ABSTRACT: A stacked rubber spring has been extensively used on railroad locomotives and cars because unlike steel springs, it can be changed into all sorts of shapes to produce different stiffness from the front to the rear to satisfy the vibration attenuation requirement and to hold a steady position as well. Its introduction greatly simplified the designing of the bogie structure. Its good horizontal elasticity also makes it suitable for locomotives. At present, many countries are using rubber springs as suspension springs and the most common type is the stacked rubber. In 1975, the author and colleagues carried out a study on the mechanical property of rubber with a rubber stack installed in a ND_4 internal combustion locomotive, a dynamic test of its vertical compression stiffness and horizontal shear stiffness, a fatigue test to measure its useful life, and a static property and fatigue test of the stacked rubber used in the Shaoshan-3 electric locomotive made in China. The various test data are reported.

AUTHOR: WU Jun [0702 3182]

ORG: Emei Internal Combustion Engine Service

TITLE: "Analysis of the Dongfeng-1284 Diesel Locomotive Beyond-the-Scope Repair--On the Treatment of Surface Blackening of the Commutator of the 1350 Main Generator"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 pp 49-51

ABSTRACT: Indication of trouble in the reverser began to appear when the Dongfeng-1284 locomotive was in operation less than 500 km after a major overhaul. The burned out brushes were replaced. After another 320 km, the blackening phenomenon of the septum appeared again. The power of the locomotive dropped and the engine temperature rose. After further testing and adjustment, it was decided that it could not be repaired on the track. The author and colleagues installed brushes of 2 different serial numbers (D252 and D374D) although according to the regulation brushes of identical serial numbers should be used. After such a treatment, the locomotive has been in operation for 20,000 km. The oxidation film of the reverser remains good and the brush surface shiny.

AUTHOR: ZHANG Haiying [1728 3189 5391]

ORG: South Section, Zhengzhou Maintenance Crew

TITLE: "Experiment With Reconstructing the Oxidation Film of the ZQDR-204 Electric Locomotives"

SOURCE: Zhuzhou JICHE DIANCHUANDONG [ELECTRIC DRIVE FOR LOCOMOTIVE] in Chinese No 3, 81 p 50

ABSTRACT: Ever since the Dongfeng electric drive internal combustion locomotives began to operate in the south section of Zhengzhou, the reverser surface oxidation films under some brushes have frequently become broken or lost during the cold, dry, and windy winters. New brushes often wear out after running 200-300 km. The trouble was often mistakenly thought to be a deformed plate in the reverser. In reality, under the adverse weather condition, with the relatively low current density, the oxidation film breaks down gradually and will disappear completely. The author and colleagues, during Jan 1976, tried a method of removing the negative brush and allowing all 3 positive brushes on each row to remain. The current of each motor was controlled in the range of 500-600 amp and the temperature of the reverser at 50-60°C. In this manner, a new oxidation film was established after a distance of 203 km. The negative brush was reinstalled at that point and the motor operated normally. The same method was tried again on 5 Feb 80 and the result was equally satisfactory.

6168
CSO: 4009/63

AUTHOR: SHEN Zongshu [3088 1350 2885]
GAO Ke [7559 2688]
ZHANG Dehan [1728 1795 3352]

ORG: SHEN of the Hydropower Automation Teaching and Research Group, Department of Electric Power, Huazhong Institute of Technology; GAO and ZHANG both of the Electromechanical Group, Kunming Survey and Design Institute, Ministry of Electric Power Industry

TITLE: "Stability and Operation Boundaries of Water Turbine Regulating System"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 3-11

TEXT OF ENGLISH ABSTRACT: This paper demonstrates that, according to field tests and operation experience of a two-cascade hydroelectric station, the theory of stability and operation boundaries is applicable to water turbine regulating systems.

AUTHOR: WU Jianguo [0702 0256 0948]
GUO Xijiu [6753 6932 3773]

ORG: Both of Chongqing Power Industry Bureau

TITLE: "An Error-correcting Program for Computer-Computer Communication"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 18-27

TEXT OF ENGLISH ABSTRACT: In this paper, the advantages of employing software for coding, decoding and error-correcting in computer-computer communication are discussed, and two error-correcting programs using the calculation method and comparison method, checked on the CK-720 computer, are proposed. After analyzing advantages and disadvantages of the two methods, the paper indicates that, in general, the comparison method is preferable.

AUTHOR: SHI Shiwen [0670 0013 2429]

ORG: Nanjing Institute of Technology

TITLE: "Analysis of Phase-sensing Circuit for Protective Relaying"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 38-47

TEXT OF ENGLISH ABSTRACT: In this paper, ring-type diode phase-sensing circuits for protective relaying are discussed. First, when input voltage is coincident in phase or opposite in phase, the fundamental principle of the circuits is analyzed. Then, in the presence of any phase difference of input voltages, the relation between average value of output current and phase difference of input currents, and harmonics contained in output current are investigated. The paper concludes that views contained in some of the literature are disputable.

AUTHOR: NIE Tao [5119 3447]
LI Qingxian [2621 1987 7359]

ORG: NIE of the Beifang Jiaotong University; LI of the Nanjing Automation Research Institute

TITLE: "Investigation of Index of Nonlinear Distortion in Data Transmission Channel"

SOURCE: Nanjing DIANLI XITONG ZIDONGHUA [AUTOMATION OF ELECTRIC POWER SYSTEMS] in Chinese No 5, 1981 pp 48-51

TEXT OF ENGLISH ABSTRACT: In this paper, the influence of nonlinear distortion on data signal of channels is analyzed, and thus a formula for calculating the amount of distortion is derived. Taking 600/1200 bit/sec mode, for example, the nonlinear distortion index of data transmission channel is determined.

9717
CSO: 4009/56

Loading, Unloading Machines

AUTHOR: None

ORG: Hoist and Transport Machinery Teaching and Research Office, Wuhan College of Water Transport Engineering

TITLE: "General Situation and Developing Tendency of Harbour Loading and Unloading Machines"

SOURCE: Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 3, 6 Jun 81 pp 2-8

ABSTRACT: Water transport has progressed a great deal in recent years. It is estimated that it takes a 50-thousand-ton cargo ship of a speed of 18 knots 16 days to travel 7000 nautical miles but loading and unloading the cargo at 6 harbors in the journey will take up 37 days. Foreign countries do not really have many loading and unloading machines, but what they have are well coordinated and efficiently used. The productivity of China's harbor workers is about 1800 tons/year/person, amounting to only 8 percent of that of advanced countries. After serious analyses, the paper concludes that ways of catching up may be summarized into bulk transport and containerization. Machines needed to load and unload containers and loose cargo of bulk transport are introduced separately. Efficiency of an individual machine does not guarantee high efficiency of the entire transport process, however. The paper points out, finally, that when harbor equipment is selected and the productivity and other parameters of a given piece of equipment is determined, consideration should be given not only to the machine itself, but also to the load-

[continuation of QIZHONG YUNSHU JIXIE No 3, 81 pp 2-8]

ing and unloading techniques and the entire transport process of a given type of cargo so that the entire transport process be made economical and reasonable.

AUTHOR: SHEN Yulin [3088 3768 7792]

ORG: None

TITLE: "The Structure, Manufacture, and Installation of the 200-ton Gantry Crane Used for Shipbuilding"

SOURCE: Beijing QIZHONG YUNSHU JIXIE [HOISTS AND CONVEYANCES] in Chinese No 3, 6 Jun 81 pp 8-19

ABSTRACT: The 200-ton gantry crane system of Tanggu New Harbor of Tianjin was manufactured by Taiyuan Heavy Machinery Plant with the help of Qinghua University. Since it was installed in 1976, the actual production process has proved the crane to meet the basic requirements of design, manufacture, and installation quality. For future development of the shipbuilding industry, the paper recommends this type of crane very highly. In retrospect, the following shortcomings remain, however. (1) The operating track of the crane should be installed to coordinate with the assembly and welding shop, the platform, the yard, the dry dock, etc. so that the crane will not be left somewhere by itself unavailable for use. (2) A pair of gantry cranes with intercrossing tracks may be more reasonable than a single gantry crane. (3) To avoid waste, the manufacturing process should be determined by the total installation design, and the structure design should follow as the third step. (4) Different structures of gantry cranes should be seriously compared to determine the most desired one. (5) Problems of DC motor drive, automatic stop when the wind speed exceeds the limit, ease of adjustment of interspace, etc. are all worthy of further study and improvement.

6168
CSO: 4009/49

AUTHOR: None

ORG: Research Section of Rock Fragmentation, Northeast Institute of Technology

TITLE: "Measurement of Rock Drillability by an Impact Failure Method and Predicating of Drilling Efficiency"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 1-7

TEXT OF ENGLISH ABSTRACT: A simple drop tester that can measure the rock drillability either in fields or in laboratories has been designed and manufactured. The specific energy of impact failure and the wear width of bit edge are used to express the rock drillability. Drillability indices of 806 samples of 62 kinds of rocks taken from 37 mines, tunnels and construction sites have been determined.

The correlations between the drillability indices and the penetration rates of several types of drill equipment have been investigated. Results of their regression analyses indicate that there is a significant correlation between the specific energy of impact failure and the penetration rates.

We suggest the classification of rock drillability by the impact failure method. There are seven rock classes (I-VII) according to the classification of the specific energy of impact failure, and there are three rock kinds (1-3) according to the

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 1-7]

classification of the wear width of bit edge. Both indices are used to express the drillability.

The above classification methods have been adopted by several mines and good results have been obtained.

AUTHOR: YU Xuefu [0060 1331 7450]
QIAO Duan [0829 4551]

ORG: Both of Beijing University of Iron and Steel Technology

TITLE: "Theory of Axial Variation and Three Rules of Axial Ratio for Stabilizing Country Rocks"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 8-15

TEXT OF ENGLISH ABSTRACT: The design of the width and height of underground excavations is determined and corrected mainly based on the equipment specifications and operation conditions, considering various types of support structures. However, in the case of some unstable country rocks and excavations more difficult to maintain, the design method mentioned above neglects the important role of the excavation axial ratio and earth stress in maintaining excavation stability.

The so-called "Theory of Axial Deformation" is designated as a theory of the important effect of the variation in axial ratio on controlling deformation and breakage of country rocks. The earth stress is an essential force causing rock deformation and breakage. In view of this, the excavation axial ratio for stabilizing country rock is directly relative to earth stress.

Based on the fact that earth stress on excavations is different with variation of direction, the present paper applies the three rules, i.e., "axial ratio of

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 8-15]

isostress," "axial ratio of stress distribution" and "axial ratio for stabilizing country rock," to describe the relationship among excavation axial ratios for stabilizing country rock.

AUTHOR: DENG Xipeng [6772 6932 7720]

ORG: Research Institute of Mining, Changsha

TITLE: "The Friction Pairs of Iron Base Alloys and Copper Base Alloys Used in Blast Bits"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 16-20

TEXT OF ENGLISH ABSTRACT: This paper broadly describes the model experimental results of the friction pairs used in blast bits. The influence of the type of friction pair on the properties of anti-adhesion and anti-adhesive wear are investigated in particular. Based on the model experiments, new friction pairs are selected and manufactured. They are iron base alloys and copper base alloys. Their properties of anti-adhesion and anti-adhesive wear are preferable to the friction pair of alloys based on cobalt and alloys based on silver, widely used in the manufacture of blast bits abroad. A definite store of mine experiments shows that the new friction pairs cannot only take the place of the friction pair of Co-AgMn, but can also increase the service life of blast bits. At the same time, the new friction pairs are in accordance with the resources of China and their production cost is very low. Therefore, they are suitable for extensive use.

AUTHOR: SHEN Yingzhu [3088 2503 4554]

ORG: Xiangtan Electrical Machinery Plant

TITLE: "Domestic Model SF-3100 100 Ton Electric Dump Truck for Mines"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 21-26

EXCERPTS FROM ENGLISH ABSTRACT: Studied and designed by the combined efforts of Xiangtan Electrical Machinery Plant, Anshan Metallurgical and Mining Company and Changchun First Motorcar Manufacture Plant, and trial-produced by Xiangtan Electrical Machinery Plant, the Model SF-3100 100 ton electric drive dump truck has been tested in industrial operation for nearly three years. In August, 1980, the First Ministry of Machine Building and the Ministry of Metallurgical Industry appraised its quality and approved trial production of this dump truck in small batches.

The First Ministry of Machine Building has appointed the Xiangtan Electrical Machinery Plant as the manufacturer of the Model SF-3100 100 ton electric drive dump truck. Based on experience obtained in recent years and advice received from relative parties, the quality of trial-produced trucks in small batches will be further improved and the price will be greatly reduced. We are confident that through the joint effort of our customers and our plant, the Model SF-3100 100 ton dump truck will become an effective means of transportation in surface mines and large scale dam projects.

AUTHOR: None

ORG: Shizhuyuan Project Group, Hunan Metallurgical Research Institute

TITLE: "Technological Study of Complex WO_3, Mo, Bi Ore Beneficiation"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 27-31, 15

TEXT OF ENGLISH ABSTRACT: Shizhuyuan ore occurrence, Hunan Province, is the extra big complex deposit in China, containing WO_3, Mo, Bi and Sn minerals and fluorite. Technological processes for treating ores from the deposit were studied by the Hunan Metallurgical Research Institute in cooperation with Beijing Mining and Metallurgical Research Institute, Research Institute of Mining and Metallurgy, Changsha, and Shizhuyuan Polymetal Mine. Commercial-scale experiments on its greisen-skarns ore have been run for five years. The flowsheet tested consisted of coarse grinding followed by gravitation for recovering most coarse tungsten minerals; bulk flotation of wolframite and scheelite; separate cleaning of gravity and flotation rough concentrates; bulk-selective flotation for recovering Mo, Bi minerals and, finally, flotation of fluorite.

The above flowsheet provides satisfactory results, recovering 81.69 percent WO_3, 83.55 percent Mo, 68.29 percent Bi and 28.76 percent CaF_2 in corresponding concentrates, i.e., scheelite, wolframite, molybdenum, bismuth and fluorite

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 27-31, 15]

concentrates, grading 67.52 percent WO_3, 66.29 percent WO_3, 46.72 percent Mo, 29.17 percent Bi and 97.31 percent CaF_2 respectively.

AUTHOR: CENG Guangfu [2582 1639 4395]
SHENG Nengqing [4141 5174 1987]

ORG: CENG of the Xiaolong Tungsten Mine, Jiangxi Province; SHENG of Jiangxi Metallurgical Research Institute

TITLE: "Treatment Flowsheet Test of Tungsten Ore Slime"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 32-35

TEXT OF ENGLISH ABSTRACT: The Xiaolong tungsten ore deposit in Jiangxi Province is of the type of high temperature hydrothermal fissure filling, containing wolframite in quartz veins. There is also a small amount of associated scheelite in addition to wolframite. Other metallic minerals are pyrite, chalcopyrite, pyrrhotite, arsenopyrite, etc. Gangue mineral is primarily quartz.

The mine adopted the table for testing the tungsten ore slime of +40μ size, and the flowsheet of centrifugal separator-flotation for testing the slime of 40-10μ size, both achieving good results. When feed grade is 0.64 percent WO_3, a concentrate of 38.75 percent WO_3 can be obtained, with a recovery of 64.71 percent. Operation recovery achieved by the table, centrifugal separator and flotation are 50.14 percent, 66.92 percent and 96.70 percent respectively; the ratios of concentration are 37.5, 49.5 and 2.7 respectively.

AUTHOR: WU Jihui [0124 0679 2547]
LI Youmei [7812 0645 2734]
OU Jinming [0575 6651 2494]

ORG: All of Guangxi Metallurgical Research Institute

TITLE: "Study on Purification of Effluents from Changpo Mill by Flotation-precipitation Process"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 36-43

TEXT OF ENGLISH ABSTRACT: This paper describes the flotation-precipitation process which has been used to purify the mill effluents, in which the contents of Pb, Zn, Cu, Sb, As, Cd, CN^- and xanthate exceed the national industrial water discharge standard. Effluents can be purified under the standard of industrial water discharge only by conventional, inexpensive reagents and, concurrently, some valuable metals can be recovered from the effluents. The effluents contain (mg/l): 3.75 Cu, 80.78 Pb, 31.75 Zn, 20.90 Fe, 0.33 Cd, 58.33 Sb, 2.52 As, 6.40 CN^-, xanthate 0.83, $S^= < 0.5$, with cyanide complex accounting for 79.5 percent. The pH value of the effluents is 6.5.

In order to break the complex, sulfuric acid is first added into the waste water, regulating the pH to a reasonable value. Then sodium sulfide is added, making most of the heavy metal ions precipitate as sulfides. Finally, flotation is employed to separate them from water.

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 36-43]

After the breakage of the complex, the separated heavy metal xanthates can be floated by aeration (ion flotation); all the precipitates are able to float after the addition of a small amount of xanthate (precipitation-flotation); suspensions in the effluents (fine-size lead-antimony mineral) float together with precipitates (ultrafine flotation). This process is a combination of ion flotation, precipitation-flotation and ultrafine flotation. The froth product can be combined into the mill concentrates. By flotation, Cu, Cd, As and xanthate in waste water can be purified under the industrial water discharge standard. More than 85 percent of the Pb, Sb and Zn and some 50 percent of the CN^- can be removed, respectively.

The residual contents of Pb, Sb, Zn and CN^- have not yet come up to the standard, so they need further treatment. For purification, iron sulfite and lime are added to the tail water. Molysite reacts with cyanic ions, forming the precipitate of iron cyanide complex. Lime makes part of the sulfate form the precipitate of calcium salt, while most of it is hydroxide precipitate. The effect of purification is good because of the co-precipitation of hydroxide.

This paper describes in detail the influential factors in the process of effluents purification, such as pH value, the reacting time of sulfuric acid, the amount and reacting time of sodium sulfide, amounts of xanthate and iron sulfite and the reduction of the amount of H_2S, etc. The optimum value is given as a controlling factor of the effluent purification process.

AUTHOR: HU Weibai [5170 3634 2672]
ZHAO Yongquan [6392 3196 3123]

ORG: HU, professor, Central South Institute of Mining and Metallurgy; ZHAO, engineer, Beijing Mining and Metallurgical Research Institute

TITLE: "The Technological Categories of Ores"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 44-49, 43

TEXT OF ENGLISH ABSTRACT: Some suggestions for the establishment of a new course entitled "The Technological Categories of Ores" are first summarized. It consists of systematic classification of important industrial ores according to their technological behavior. The main function of such a course would operate at the preliminary evaluation of the ore, the selection of the processing method, the assertion of treating the flowsheet and the prediction of the feasibility and probable metallurgical results.

Criteria for classification include: beneficiation characteristics, size of liberation, selective leaching and smelting properties, the composition of valuable minerals and gangues, the intergrowth and combination of metallic elements, the ore texture and structure, and other special technological processing factors. Although the classification is very comprehensive, a systematized knowledge of

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 44-49, 43]

mineral processing and extractive metallurgy should be used to arrange the technological categories into rather brief and obvious form. For example, the categories of placer gold ore, uranium ore, ferrous ore and tin containing polymetallic ore are classified as illustrated.

AUTHOR: WEI Shoukun [7614 1108 2492]
HONG Yanruo [3163 1750 5387]

ORG: Both of Beijing University of Iron and Steel Technology

TITLE: "Thermodynamics and Kinetics of the Selective Oxidation of Nickel Matte"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 50-60

TEXT OF ENGLISH ABSTRACT: During direct winning of metallic nickel by blowing nickel matte with oxygen, the key lies in removing sulfur and preserving nickel. In this paper, based on the principle of selective oxidation, a concept of transition temperature of oxidation is introduced. Thermodynamic analysis shows that the conditions for removing sulfur while preserving nickel are:
1. The temperature of starting oxygen blowing of nickel matte must be higher than the transition temperatures of oxidation for sulfur and nickel at the specific compositions of the nickel matte; for the nickel matte with 20-25 percent S, the starting temperature should never be lower than 1350-1400°C.
2. With the decrease of sulfur content in nickel matte melt during blowing, the transition temperatures of oxidation for sulfur and nickel increased correspondingly. The blowing operation should be run fast enough so as to ensure that the rate of increase in the temperature of the melt will always be higher than the rate of increase of the transition temperature of oxidation. The transition temperatures of oxidation for sulfur and nickel can be calculated in one step according to the

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 50-60]

reaction: $[S] + 2NiO_{(5)} = 2[Ni] + SO_2$. In addition, thermodynamic analysis showed that:

1. The copper in the nickel matte remained entirely in the melt and was not oxidized during blowing.
2. The iron in the nickel matte was oxidized most easily, but as soon as its content dropped down to about 0.8 - 1.0 percent, it could not be oxidized further, and remained as residual iron in the melt.
3. Any cobalt in the nickel matte remained as residual cobalt if its original content was below 1 percent.

By maintaining the optimum conditions for removing sulfur while preserving nickel as deduced thermodynamically above, semicommercial experiments in a Kaldo converter were conducted, with the result that sulfur in the matte could be successfully reduced down to 1-2 percent. During the last stage of blowing, due to the slowing down in diffusion of sulfur to the surface of the bath, a layer of NiO was seen accumulating on the surface. Running the converter without oxygen-blowing was taken to eliminate the NiO-layer and promote further lowering in sulfur. The direct recovery of nickel was above 90 percent, while the total recovery of nickel was higher than 95 percent. The loss of nickel was found mainly due to volatilization of the oxide or metal. Thermodynamic prediction of residual copper, iron and cobalt in the metal melt was also experimentally confirmed.

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 50-60]

Kinetics analysis showed that the diffusion of sulfur in the melt was the rate-controlling step for the desulfurization of nickel matte. The mass-transfer and diffusion coefficients (β and D) have the following relations regarding temperature (T) respectively:

$$\beta = 8.30 \exp\left(\frac{-25000}{RT}\right) \quad D = 8.30 \times 10^{-2} \exp\left(\frac{-25000}{RT}\right)$$

AUTHOR: WANG Wenshao [3769 2429 4801]
ZHOU Chengtai [0719 2110 3141]
YANG Deying [2799 1795 5391]
LI Yuzhen [2621 3768 3791]

ORG: WANG and ZHOU both of Shenyang Smelter; YANG and LI both of Liaoning Metallurgical Institute

TITLE: "Fixation of Arsenic in Industrial Calcium Arsenate Sludge at Moderate Temperatures"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 61-65

TEXT OF ENGLISH ABSTRACT: The sludges containing arsenates were generally formed during the removal of arsenic with limestone from waste water or effluent generated in nonferrous metallurgical processes. But these arsenates in the sludges were characterized by being able to dissolve in water to a certain extent, and they could not be directly discharged to land or sea area. This paper describes the fixation of arsenic in industrial calcium arsenate sludge by a simple calcination process at moderate temperatures. The typical sample used contained 7-8 percent As and 26-32 percent CaO. It was generated from the effluent after recovering indium and germanium in the zinc hydrometallurgical process. Samples in dry or slurry states were calcined in the temperature range of 400-800°C for one to three hours, and then the calcine products were leached by water at different pH values

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 61-65]

to determine how many arsenates in them had become insoluble crystalloid. At the same time, the calcine products were examined by an X-diffractometer to observe what changes had happened in them. The results obtained showed that the fixation of arsenates could be achieved completely by calcination at 700°C for one hour, and the arsenic concentration in the leaching solution of the calcine less than 0.5 mg/l, which might meet the emission standard of the state environmental protection legislation. Thus the method could be considered an acceptable approach for the pollution-free disposal of the calcium arsenate sludge.

AUTHOR: LIU Anyu [0491 1344 1342]
FENG Chunhua [7458 2504 5478]
LIN Yayan [2651 0068 3543]
YANG Kexun [2799 0344 6064]

ORG: All of Jinchuan Nonferrous Metal Company Smelter

TITLE: "Discussion of Optimum Position of Slag Taphole of the Ore-heat Electric Furnace"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 66-70

TEXT OF ENGLISH ABSTRACT: By sampling the electric furnace in different sections, the dependence between the nickel contained in the slags and the bath deep was found as follows:

$$Y = 1.04 - 1.16h + 0.37h^2$$

For this reason, the slag taphole of the ore-heat electric furnace was moved up from 1.317 to 1.55 m. The practice proved that the nickel obtained in the slags decreased from 0.18 to 0.14 percent in the first six months last year.

AUTHOR: ZHAO Wuwei [6392 2477 3956]

ORG: Zhengzhou Light Metal Research Institute

TITLE: "Cone Bipolar Electrolysis"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 71-77

TEXT OF ENGLISH ABSTRACT: A cone bipolar electrolytic cell was proposed, which is a sealed-type electrolytic cell having a raw material aluminum chloride feeding port and chlorine gass discharging ports in a top section and a molten metal reservoir in a bottom section, and is provided with an electrode element in the intermediate section so that a molten salt electrolytic bath containing aluminum chloride is electrolyzed in the cell and molten aluminum is collected from the metal reservoir in the bottom. A method for producing metal by electrolysis in a molten salt bath containing superimposed electrodes, at least one of which is a cone bipolar electrode, is presented. The arrangement of the electrodes creates interelectrode spaces between them. If there are N cone bipolars, this cell has N+1 interelectrode spaces. The spacing is of the order of less than 2.0 cm. A process was suggested for producing aluminum by electrolyzing fused aluminum chloride to produce chlorine gas at the anode surface and molten aluminum at the cathode surface. This method is improved by providing circulation of the bath from an interelectrode space to the next one at a location inside the outer peripheries of the electrodes. This can be accomplished by, for example, boring holes through the cone electrodes. It

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 71-77]

can also be accomplished by breaking the electrodes into individual, mutually separated stacks of electrodes, the circulation of the improvement then occurring, for example, in the space between the stacks. The electrode element is formed of Λ-shaped electrodes laminated at a fixed distance (about 2.0 cm) between the electrodes or a part of right and left electrode plate groups opposite each other at a fixed separation between them and inclined upward and inward. At least one intermediate bipolar electrode is provided between both cathode and anode and a gas centric rising passage is formed between the electrodes.

A molten aluminum falling passage is formed between the outer edges of the cone-shaped electrodes or plate-shaped electrodes and the internal wall of the cell to prevent the rechlorination of the aluminum after electrolysis. The electrolytic bath is of mixed molten salts consisting of 85 to 90 percent by weight NaCl, LiCl, KCl and $MgCl_2$, and 5 to 15 percent by weight $AlCl_3$. Metallic aluminum can be produced by electrolyzing aluminum chloride at a high current and voltage efficiency, reaching about 85 to nearly 90 percent and 55 to 70 percent respectively. This process can be used to produce other metals and alloys, such as magnesium and aluminum-magnesium.

AUTHOR: LI Jinghua [2621 0079 5478]

ORG: Cultural Relic Research Institute, Henan Province

TITLE: "The Investigation of the Ancient Gold Mine Ruins in Qinling"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 78-79, 65

TEXT OF ENGLISH ABSTRACT: According to stone inscription records, there were extensive mining activities in the ancient gold mines in Qinling, Henan Province, in the Ming Dynasty (1452 AD). Eight hundred old pits have now been found. The detailed investigation in the pits has shown that a rock breaking method with wood combustion and sudden cooling afterwards was widely used at that time, and that gunpowder blasting was also applied. This agrees with the historical records.

AUTHOR: LIU Guozao [0491 0948 5679]
et al.

ORG: None

TITLE: "Famous Antimony Mine--Xikuangshan"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 3, Aug 81 pp 80-83

EXCERPT FROM ENGLISH ABSTRACT: The Xikuangshan Mine is a world-famous large antimony mine. It was discovered in 1541 and was mined early by the people. It was named Xikuangshan (Tin Mine) because of the mistaking of antimony for tin. It was mined officially in 1892. Smelting of crude antimony was carried out by liquidation of high-purity massive stibnite in 1893. Pure antimony was produced by the Huachang Company in 1908. More than 40 smelters were built by the Chinese mining businessmen and foreign businessmen from England, Germany and other countries during the First World War. The Xikuangshan Mining Administration was set up after the founding of the PRC. Complete technical reformation was carried out at the old mine, with product quality raised and variety and capacity increased. Mineral resources are still rich at present.

The Xikuangshan Mining Administration lies in Lengshuijiang City in Hunan Province with convenient land and water communications. The area of the mining district is 14 sq km, divided into southern and northern sections. Sulfide ores occur at the

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 80-83]

southern part, while at the northern part are oxide and sulfide complex ores. Independent production systems of mining, mineral processing and smelting have been formed because of different kinds of production technology due to different natures of ores: Southern Mine, Southern Concentration Plant, Southern Smelter; Northern Mine, Northern Concentration Plant, Northern Smelter. Auxiliary facilities: maintenance and repair shop, water and electricity sections and transportation, sales departments and antimony hydrometallurgy plant soon to be commissioned. In addition, the Administration also includes a research institute and facilities for design, environmental protection and metering.

Both the Southern and Northern Mines adopt shaft sinking development, room and pillar method and cementation filling for mining. The Southern Concentration Plant utilizes hand picking, heavy media separation and flotation flowsheets. Hand picking-gravity concentration-flotation combined flowsheet is used at the Northern Concentration Plant. The Southern Smelter treats antimony sulfide flotation concentrate and massive concentrate produced by hand picking at the Southern Concentrating Mill. Antimony sulfide is oxidized into antimony oxide through volatilizing smelting or roasting. Antimony metal is formed by reduction smelting and refining of antimony oxide in a reverberatory furnace. The Northern Smelter produces antimony regulus, antimony white and crude antimony, its raw material coming from antimony sulfide and oxide bulk concentrates produced by hand picking, gravity concentration and flotation at the Northern Mill. The production process

[Continuation of YOUSE JINSHU No 3, Aug 81 pp 80-83]

of antimony regulus is approximately the same as that at the Southern Smelter. Some kinds of antimony regulus can be used as the raw material of antimony white, feeding into a special furnace with air blasting to be oxidized into Sb_2O_3. Crude antimony is pure Sb_2S_3, which is made from high grade massive stibnite by heating and liquation.

The quality of the products produced at Xikuangshan Mining Administration has reached the advanced levels of the world, and are able to meet the demands of users at home and abroad. Antimony regulus No 1 had the honor of winning a silver medal in September, 1980, because of its high quality.

According to the standard GB 1599-79 of the PRC, the following products can be supplied:
Antimony regulus No 1 (Sb-1) (99.85 percent Sb);
Antimony regulus No 2 (Sb-2) (99.65 percent Sb);
Antimony regulus No 3 (Sb-3) (99.5 percent Sb);
Special antimony white (Sb_2O_3-01) (99.5 percent Sb_2O_3);
Antimony white No 1 (Sb_2O_3-1) (99.0 percent Sb_2O_3);
Crude antimony (Sb_2S_3-1) (70-73 percent Sb).

9717
CSO: 4009/34

AUTHOR: ZHANG Gongan [1728 0501 1344]

ORG: Department of Mathematics

TITLE: "The L_2-theory of Dirichlet Problem for Strongly Elliptic Systems with Unbounded Coefficients"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 1-17

TEXT OF ENGLISH ABSTRACT: In this paper we made use of Ladyzhenskaya's methods to consider a Dirichlet problem for strongly elliptic systems, the leading coefficients of which are to be continuous in domain Ω and other coefficients in space $L_3(\Omega)$.

In the first part of this paper we obtain the Garding inequality and uniqueness theorem of the solution to the Dirichlet problem. In the second part we prove the existence of this solution. The proof is based on the representation theorem. In addition, we solve the eigenvalue problem using the Lax-Milgram theorem. In the third part we give the proof of the differentiability of generalized solutions. The proof proceeds by differencing the equations and applying the Garding inequality to derive estimates for the difference quotients of the solution.

AUTHOR: SHAO Zhenhao [6730 7201 6275]
LI Jiaren [2621 1367 0088]

ORG: Both of the Department of Mathematics

TITLE: "The Computation of Interior of Large Cooling Tower"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 18-26

TEXT OF ENGLISH ABSTRACT: In this paper we have carried out the computation of internal forces of a large cooling tower with wind load. The numerical solutions with boundary conditions and the difference between moment solution and non-moment solution are given here.

AUTHOR: ZHAO Weili [6392 3634 4409]

ORG: Department of Mathematics

TITLE: "A Class of Singular Perturbations of Boundary Value Problems for Ordinary Differential Equations on Infinite Interval"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 27-36

TEXT OF ENGLISH ABSTRACT: In this paper we prove the existence, uniqueness and convergence of a class of singular perturbations of boundary value problems on infinite interval for ordinary differential equations

$$\begin{cases} \varepsilon \dfrac{d^2x}{dt^2} = F(t,x)\dfrac{dx}{dt} + G(t,x), \\ x(-\infty,\varepsilon) = a,\ x(\infty,\varepsilon) = b \end{cases}$$

under certain conditions. Here ε is a small positive parameter, and a, b are given constants.

AUTHOR: ZHOU Qinde [0719 2953 1795]

ORG: Department of Mathematics

TITLE: "The Asymptotic Expansions of the Solutions of a Class of Singular Perturbation Boundary Value Problems"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 37-50

TEXT OF ENGLISH ABSTRACT: Taking the problem of smoothing the discontinuous self-similar solutions of the system of hyperbolic equations as a research background, in this paper we discuss the asymptotic expansion of the solution of the equation of second order with a small parameter $\varepsilon > 0$

$$\varepsilon u'' = F(\xi,u)u'$$

which satisfies the boundary value conditions

$$u(\pm\infty) = u^{\pm}(\varepsilon),$$

where $u^{+}(0) < u^{-}(0)$. This paper is a generalization of a previous article.

AUTHOR: WANG Junyu [3769 0193 4416]

ORG: Department of Mathematics, Mathematics Institute, Jilin University

TITLE: "Initial Boundary Value Problems for Some Nonlinear Incomplete Parabolic Systems (I)"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 51-59

TEXT OF ENGLISH ABSTRACT: In this paper we consider periodic and first boundary value problems for nonlinear incomplete parabolic systems

$$\begin{cases} u_t - au_{xx} - [p(u,v)]_x + f(u,v,u_x) = 0, \\ v_t + bv_x + g(u,v,u_x) = 0 \end{cases}$$

and give sufficient conditions to ensure the existence and uniqueness of global solutions by means of the theory of nonlinear semigroups.

AUTHOR: DING Peizhu [0002 1014 2691]
PAN Shoufu [3382 1343 3940]

ORG: Both of the Institute of Atomic and Molecular Physics, Jilin University

TITLE: "The Method of Numerical Solution of Mach-Zehnder Interferogram Analysis of Supersonic Airflow about Cylindrical Symmetric Projectiles"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 60-71

TEXT OF ENGLISH ABSTRACT: The method of numerical solution of four physical conclusions and "The Abel Transformation of Plasma Spectroscopy Involving Shock Waves" obtained by the same authors in a previous article is extended to Mach-Zehnder interferogram analysis of supersonic airflow about cylindrical symmetric projectiles. Three similar physical conclusions about the relation between the interferometric fringe shift, $\delta(x,z)$, measured from M-Z interferogram, and the density difference, $\rho(r,z)-\rho_0$, at each point in the supersonic airflow field are botained, and all transformation coefficient formulas used to calculate the density difference, $\rho(r,z)-\rho_0$, according to the interferometric fringe shaft, $\delta(x,z)$, are given. As an example, using experimental data given by Bennett, airflow field of cylindrical symmetric projectiles is calculated and better results have been obtained. A simplified calculation method which deals with many shock waves existing in the airflow field is given.

AUTHOR: SHEN Jiacong [3088 1367 7500]
YANG Meilin [2799 2734 2651]

ORG: Both of the Department of Chemistry

TITLE: "The Graph Analysis of the Living Polymerization with Monomer Transfer"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 72-84

TEXT OF ENGLISH ABSTRACT: A new graph analysis method based on the probability functions of the basic processes in addition polymerization is presented. It is applicable to any system of addition polymerization. The problem of monomer transfer in living polymerization is treated theoretically. The molecular weight distributions and the average degrees of polymerization have been obtained by this method. The properties of the distribution under some conditions are discussed.

AUTHOR: CHENG Yuhua [4453 3768 5478]
WANG Jindui [3769 0093 1018]
WANG Jingtiao [3769 2529 6006]
WANG Zhizhong [3769 3112 0022]
WANG Yuwen [3769 3768 2429]

ORG: CHENG, WANG Jindui, WANG Jingtiao and WANG Zhizhong all of the Department of Chemistry; WANG Yuwen of Yitong Scientific Experiment Station of Agriculture

TITLE: "Studies on the Cause of Vigorous Growth of Plants Grown in the Fairy Ring (I)--The Relationship between the Mycelium of *Lepista caespitosa* in Soil and the Growth of Plants"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 85-91

TEXT OF ENGLISH ABSTRACT: *Lepista caespitosa*, which causes the formation of Fairy Ring, has been isolated from the tissue of fruiting bodies and from sporidium. It is different from *Tricholoma gambosum* in some physiological and biochemical characteristics. By using the method of sheet glass buried in soil, thick mycelium was found under the Fairy Ring, and the Fairy Ring moved along with the development and stretch of the mycelium. It is clearly shown that Fairy Ring is caused mainly by the metabolites of the mycelium rather than from the nitrogen source from the decomposition of the mycelium.

[Continuation of JILIN DAXUE ZIRAN KEXUE XUEBAO No 3, 20 Aug 81 pp 85-91]

The high yield of the crops (soybean, wheat, corn, Chinese sorghum and millet) on the Fairy Ring were obtained for several years.

AUTHOR: LAI Zhugen [6351 2691 2704]
LIANG Desheng [2733 1795 5116]
DAI Cuichen [2071 5488 6591]

ORG: All of the Institute of Chemistry, Chinese Academy of Sciences

TITLE: "The Quantum Chemical Basis of Effect of Opposite Terminal Groups in Conjugated Polyenic Compounds"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 92-100

EXCERPT FROM ENGLISH ABSTRACT: Recently Dai, et al., studied the electronic spectra of the conjugated polyenic compounds with two terminal groups polarizing in opposite directions, and introduced the concept of the effect of opposite terminal groups. The object of this paper is to study the effect of such groups on a quantum chemical basis.

AUTHOR: GUAN Jiwen [4619 4764 2429]

ORG: Department of Computer Sciences

TITLE: "On Linear Automata (V)--State Diagrams (The General Case)"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 101-120

TEXT OF ENGLISH ABSTRACT: In this paper we have presented the general expression of the state diagram of a general linear automaton and a sufficient and necessary condition that a set of plane graphs is realizable as the state diagram of a general linear automaton. Also included is the method for constructing such a linear automaton realizing this set of graphs in the realizable case.

AUTHOR: LI Guangrong [2621 1639 2837]

ORG: Department of Computer Science

TITLE: "The Linearization and Digitalization of Scale Value for Platinum Resistance Thermometer"

SOURCE: Changchun JILIN DAXUE ZIRAN KEXUE XUEBAO [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS JILINENSIS] in Chinese No 3, 20 Aug 81 pp 121-128

TEXT OF ENGLISH ABSTRACT: A linearized method for scale value of platinum resistance thermometer is described. The circuit is simple and the method is more accurate. In the range of 100-400°C and 300-600°C, the errors of the linearization of scale value are less than 0.02 percent.

The circuit for linearization can be applied to accurate temperature program control or fixed-point control after it is matched with an electric or manual resistance box. Some practical problems are also discussed.

The circuit provided here has been successfully applied in the temperature control of the measuring instruments of plastic parameters.

9717
CSO:4009/32

END

JPRS 79453

16 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 136

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79453

16 November 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 136

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Man-made Earthquake Experiment in Bohai Called Success
(Yin Xiwei, Liang Zhongyong; BEIJING RIBAO, 19 Sep 81) 1

Automatic Digital Precision Laser Rangefinder Developed
(Yu Feng, Zheng Feng; RENMIN RIBAO, 6 Aug 81) 3

Deep-Crust Geological Structures in China Described
(Wang Maoji, et al.; WUTAN YU HUATAN, Aug 81) 4

Simple ERTS Photograph Differentiation Method Described
(Huang Letian, et al.; JIGUANG, Oct 81) 10

Briefs

Auto Bearings Enterprise Management Seminar 15
Laser Optical Fiber Telephones 15

PUBLICATIONS

Table of Contents of 'HUAXUE XUEBAO' Vol 39 No 4, Aug 81 16

HONG KONG MEDIA ON CHINA

APPLIED SCIENCES

Conference Held on Radioactive Environments in Mines
(ZHONGGUO XINWEN, 14 Jul 81) 19

ABSTRACTS

ARCHITECTURE

JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] No 9, 1981 20

CONSTRUCTION ENGINEERING

GONGCHENG KANCHA [ENGINEERING SURVEYING] No 5, 22 Sep 81 23

CONSTRUCTION MATERIALS

SHUINI [CEMENT] No 9, 10 Sep 81 24

ELECTRONICS

DIANZI JISHU [ELECTRONIC TECHNOLOGY] No 9, 20 Sep 81 25

ENGINEERING

SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] No 3, Aug 81 26

LASERS

JIGUANG [LASER JOURNAL] No 8, Aug 81 32

MACHINE TOOL RESEARCH

JICHUANG [MACHINE TOOL] No 9, Sep 81 34

NATURAL SCIENCES

XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] No 3, 1981 35

SILICATES

GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] No 2, Sep 81 45

TECHNICAL STANDARDS

JISHU BIAOZHUN TONGBAO [TECHNICAL STANDARDS BULLETIN] No 5, 1981 ... 54

UNDERGROUND ENGINEERING

DIXIA GONGCHENG [UNDERGROUND ENGINEERING] No 9, 1981 56

APPLIED SCIENCES

MAN-MADE EARTHQUAKE EXPERIMENT IN BOHAI CALLED SUCCESS

Beijing BEIJING RIBAO in Chinese 19 Sep 81 p 1

[Article by Yin Xiwei [3009 1585 1218] and Liang Zhongyong [2733 0022 3938]: "China's First Man-made Earthquake Experiment in Bohai Is a Success"]

[Text] China's first man-made earthquake experiment at sea was conducted by the Geophysical Survey Brigade of the State Seismological Bureau at the Beijing-Tianjin-Tangshan earthquake forecast experimental field. The explosion was successfully detonated at 0000 hours on 18 August 1981, the expected goals were achieved and the experiment has opened up a new avenue for China's earthquake research.

In the past China has conducted a number of man-made earthquake tests on land and obtained definitive results. In order to carry out explorations in a broader realm, improve the accuracy of China's earthquake prediction and forecast, monitor the earthquake activities in the Beijing-Tianjin-Tangshan area more closely, study the characteristics of the crust structure and deep earthquake sources of this area and the surrounding area, and to investigate the correlation between earthquake activity and the local variation of earthquake wave velocity in the deep crust, the State Seismological Bureau established the Beijing-Tianjin-Tangshan earthquake science research and experiment ground. Using this testing ground, special-topic studies on crust structure and earthquake activity regularity of the Beijing-Tianjin-Tangshan area were conducted to improve forecast and protect the safety of the capital and the Beijing-Tianjin-Tangshan area. The man-make earthquake in Bohai is one of the principal scientific research projects of the Beijing-Tianjin-Tangshan experimental field.

The experiment in Bohai was conducted 20 meters under water at 38°50' latitude and 118°47' longitude and it is a large scale ton-level combination explosion. The on-land monitoring work was performed by more than 100 earthquake stations and mobile stations in Henan, Hebei, Shandong, Shanxi, Liaoning, Beijing and Tianjin. These stations formed a network and covered a region 500 kilometers in radius and 8 million square kilometers in area. It is a scientific experiment of a large scale.

Based on the obtained data, analysis and evaluation have confirmed that this explosion experiment is a success. It took more than 4 months from design to explosion. The experiment received great attention of the State Seismological Bureau and the leadership that participated in the activity. All the scientific and technical staff took charge in reducing the expenditures in the design and the actual operation of the experiment and decreased the total expense below the original budget by 20 percent. The comrades working at sea endured the hardship of seasickness and vomiting, worked continuously for 60 hours in wind and rain and actively contributed to the success of the experimental explosion.

This man-made earthquake at sea has also provided important data for deep crust exploration technique in the coastal area and on the propagation curve of earthquake waves. It served as an experimental basis for man-made earthquake detection at sea.

9698
CSO: 4008/7

AUTOMATIC DIGITAL PRECISION LASER RANGEFINDER DEVELOPED

Beijing RENMIN RIBAO in Chinese, 6 Aug 81 p 3

[Article by Yu Feng [0060 7685] and Zheng Feng [2973 1496]: "Our Nation Successfully Develops An Automatic Digital Long-Range Precision Laser Rangefinder"]

[Text] The JCY-3 model precision laser rangefinder successfully developed by the Earthquake Research Institute of the State Seismological Bureau (originally the Wuhan Earthquake Brigade) has passed technical evaluation after over 4 months of field tests.

The accurate distance measurements have important and broad uses in national defense and economic construction and in judging deformation and shifts of the earth's crust and similar scientific research and engineering surveying. This automatic digital long-range precision laser rangefinder developed by the Earthquake Research Institute is small; it has a long range (50 kilometers), high precision and automatic measurement. It is an indispensable instrument in measuring precise distances. For example, in earthquake deformation, the earth's crust undergoes different deformations before and after the earthquake. Through this instrument, we can know the changes in the distance between two fixed points of the earthquake region at any time as a reference for seismic forecasting. The application of this instrument is broad and the need is great.

This instrument that has been successfully developed by our nation has been evaluated by over 50 professors and experts of the State Surveying and Cartography Bureau and seismology departments. They believe the instrument has good properties and that production in batches should be quickly organized.

Photo shows mainframe of the rangefinder.

9296
CSO: 4008/463

APPLIED SCIENCES

DEEP-CRUST GEOLOGICAL STRUCTURES IN CHINA DESCRIBED

Beijing WUTAN YU HUATAN [GEOPHYSICAL AND GEOCHEMICAL EXPLORATION] in Chinese Vol 5, No 4, Aug 81 pp 193-204, 220

[Article by Wang Maoji [3769 2021 1015], Cheng Jiayin [4453 1367 0603] and Cheng Zhenyan [4453 2182 3508]: "The Regional Features of Deep-Crust Structures in China"]

[Excerpts] Based on the statistical relationship between the average Bonguer gravity anomaly and the known depth of the Mohorovicic discontinuity [M-discontinuity], we have determined the variations of crust thickness in China and proposed deep-crust structural zones. Using the correlation between gravity anomaly and topographic height, we analyzed the crust isostasy and the isostatic mechanism and thereby inferred to the crust structure. Based on isostatic conditions, the lateral variations of the average density of the upper mantle were estimated using crustal mass variations computed from seismic and gravitational data. Because deep-crust geological data on China is very sparse, the conclusions proposed here are preliminary, and they should be modified and supplemented after more geophysical data are accumulated in the future.

I. Crust thickness and deep-crust structural zones

The M-discontinuity is the boundary between the crust and the upper mantle, and is a major boundary in density. Using seismic data, the M-discontinuity can be accurately measured, and from it the variations in crust thickness can be determined. In the absence of sufficient seismic data, the M-discontinuity can be computed from Bouguer anomaly based on the correlation between Bouguer anomaly and M-discontinuity under isostatic conditions, and using seismic data as constraints. However, the isostasy mechanism is very complex; it depends not only on the variation of crust thickness, the variation of the mantle density may also be an important factor of the isostatic compensation. Local Bouguer anomalies may only partially reflect, or may not reflect at all, the variations in crust thickness. As a result, definitive relationships often do not exist among Bouguer anomaly, topographic height, and M-discontinuity. Large errors are often produced when M-discontinuity is inferred from Bouguer anomaly alone. Nonetheless, a linear relationship usually exists between the average Bouguer anomaly over a certain area and the average M-discontinuity. This is because regional isostasy can only be achieved over an area, and the regional variation of the crust density is rather gradual.

II. Crust isostatic characteristics

Local variations of the free-air anomaly are an indication of crustal non-isostasy, and variations in crust and mantle composition may also lead to free-air anomaly. For low and gradual topography over a large area, the magnitude and sign of the free-air anomaly and the isostatic anomaly are often very close, both having average values that approach zero; the free-air anomaly can be used for this case in place of isostatic anomaly. For complex and changing topography, the free-air anomaly is often directly related to the topography, and the anomaly is positive on the mountain peak and negative in the valley. This behavior also exists to a certain degree in isostatic anomaly, but its variation is smaller than that of the free-air anomaly. Before a national isostatic anomaly map is compiled, crust isostasy can be studied using Bouguer anomaly and free-air anomaly.

1. Characteristics of 1° x 1° free-air anomalies in China

Using 1° x 1° average Bouguer anomaly and average elevation data, we have compiled a national map for 1° x 1° free-air anomalies in China (see Figure 2). Local variations of the surface layer mass have already been subtracted from the graph. Judging from the trend of variation in the free-air anomaly, the anomaly field can be divided into two distinctly different parts east and west of 104°E. In the western part, the anomalies run west northwest-east west, and the amplitude and gradient are both large--from +170 mgal to -140 mgal. In the eastern part, the anomalies run north northeast-south north, and the amplitude and gradient of the anomalies are both small; the amplitude variation is ±30 mgal. East of 113°E, the anomaly is basically positive. In the western part, the free-air anomaly is closely related to the elevation: the major mountain ranges (such as the Himalayas, Kunlun, Aerjin, and Tianshan) have strongly positive anomalies, and sedimentation basins (such as Tarim, Qsaidam, and Junggar) have strongly negative anomalies. The anomaly on the Qinghai-Tibet Plateau is positive. In the eastern part of China, the relationship between the free-air anomaly and the elevation is not pronounced; for example, no pronounced effects exist on mountain ranges such as Dahingganling (900 meters), Yinshan (1,500 meters), Qinling (1,100 meters), and Nanling (400 meters) and in some sedimentation basins. This distribution of the free-air anomalies reflects the different isostatic conditions of land masses at different locations and the deep-crust earth structure.

2. Correlation between gravity anomaly and topographic height

According to the isostatic theory, the correlation between Bouguer anomaly and height can be used directly in the interpretation of the crust isostatic compensation; the stronger the correlation, the more complete the compensation. A relationship also exists between the free-air anomaly and the elevation of the measurement point; isostatic compensation can also be estimated based on this relationship. The two principal parameters in isostatic compensation are the depth of compensation and the strength of the lithosphere. The depth of compensation is approximately proportional to the regression coefficient of the free-air anomaly with respect to height, while the lithospheric strength determines the minimum area for complete isostatic compensation, which is proportional to the mean square deviation from the line of regression. Because a small regression coefficient indicates there is no increase in average crust density under the mountain ranges, compensation can be realized at a shallow depth (at the bottom of the crust). A large regression coefficient indicates that there is an increase in the average density under the mountain ranges and that compensation can be realized at a greater depth (in the mantle).

III. Lateral variation of crust density

Regional Bouguer anomalies are usually caused by the deep mass variation of the compensated topography. The variation in compensation mass reflects not only variations in crust thickness but also variations in crust and mantle density. The crust thickness can be computed from Bouguer anomaly under isostatic conditions. When the gravity anomaly caused by changes in crust thickness does not agree with the observed anomaly, the residual anomaly reflects variations in the density of the crust and the density of the mantle. Assuming the density of the mantle remains constant, variations in the density of the crust can be calculated. Similarly, variations in mantle density can be calcuated if the crust density is assumed to be a constant.

IV. Estimate the lateral variation of upper mantle density from variation in crustal mass

Assuming that compensation takes place at the M-discontinuity, we have calculated the variation in crust density in the last section by using the isostasy principle. Lateral density variations in the crust and in the mantle can also be estimated from the free-air anomaly; however, because anomaly sources at different depths cannot be distinguished uniquely, and because the depth of compensation cannot be determined, the usefulness of calculating the crustal and mantle density variation from gravity anomaly alone is limited. The method proposed here for calculating the upper mantle density variation uses composite seismic and gravitational data in computing the variation in crustal mass and then estimates the lateral variation of upper mantle density based on the variation in crustal mass; it does not involve the depth of compensation.

V. Conclusions

Based on the analysis results given above, the following conclusions can be made about the deep-crust structure in China:

1. The trend of crust thickness variation in China shows an increase in thickness from east to west. The depth of the M-discontinuity varies from 34 kilometers in the eastern coast to 68 kilometers on the Qinghai Plateau. Going from east to west, a pronounced change in the M-discontinuity depth occurs after two major gravity-step belts. These two gravity steps coincide roughly with the two steps in surface elevation, which increases from east to west.

2. Based on the characteristics of the depth variation of the M-discontinuity, the crust can be divided into two mantle-slope belts, three mantle-terrace regions, and a complex structure region which can be further divided into nine secondary and primary mantle humps and depressions.

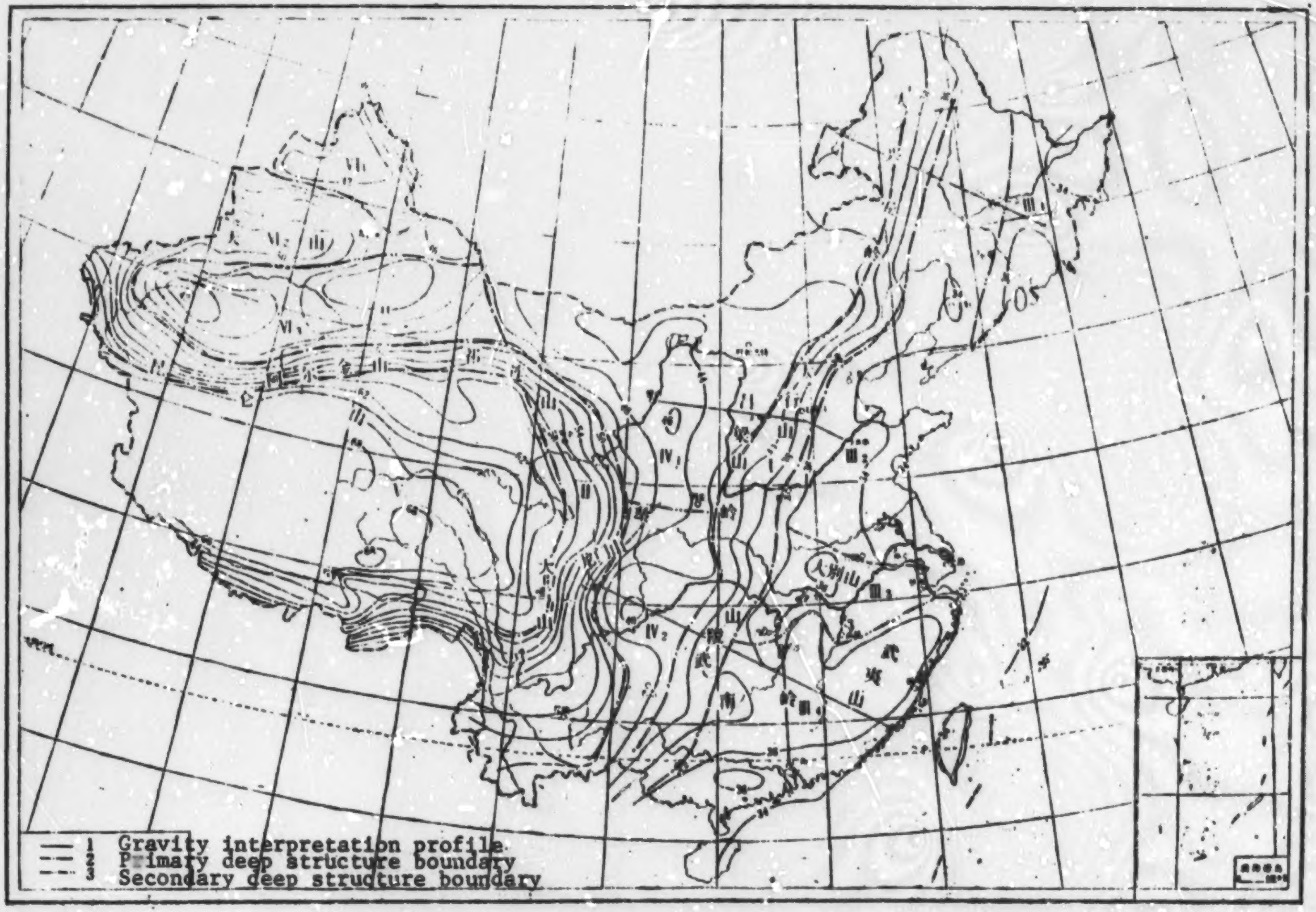

1 Gravity interpretation profile
2 Primary deep structure boundary
3 Secondary deep structure boundary

Figure 1. Depth and Structural Zones of Mohorovičić Discontinuity in China

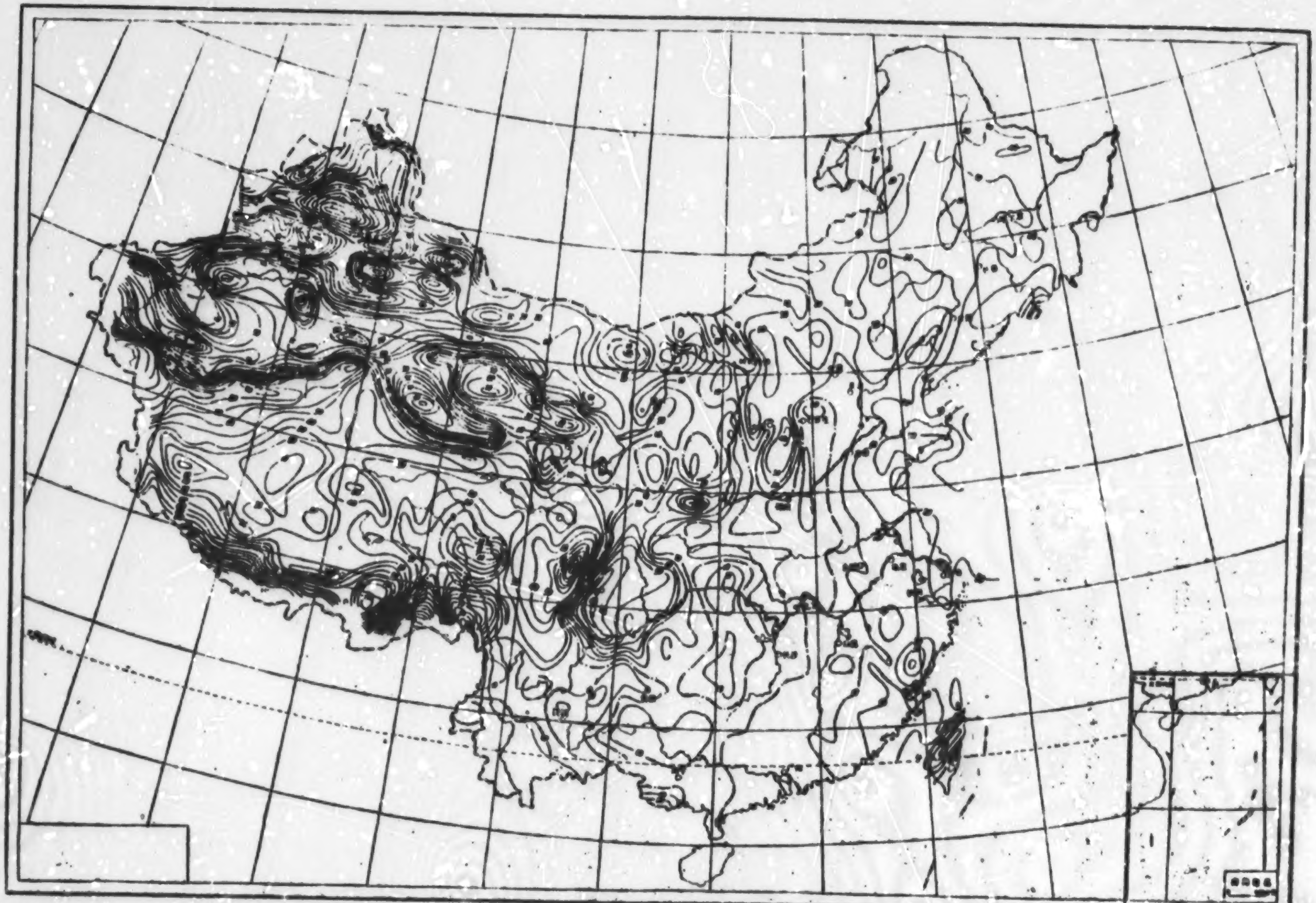


Figure 2. China's 1° x 1° Free Air Anomaly

3. The continental crust of China is basically in a state of regional isostatic equilibrium. The lithospheric strength and isostasy area in the east are smaller than those at the west; therefore, the 1° x 1° area isostasy of the east is higher than that of the west. Large deviations from local isostasy occur in the Himalayas and nearby regions.

4. The east-west structural belt of Yinsham, Qinling, and Nanling is close to a complete isostatic compensation. Because of the strong influence of the north-northeast structure belt, the east-west structure belt does not show up pronouncedly in the gravitational field.

5. The Qinghai-Tibet Plateau is an independent structural unit with thick crust and high upper mantle density. The Himalaya Mountains rose because of the collision and compression between the India plate and the Eurasia plate. Due to the action of the plate movement, the Himalayas have not reached isostatic equilibrium and have large residual masses. Strong free-air anomaly indicates intense activities in this structural zone.

6. The gravitational and isostatic characteristics in eastern and western China are noticeably different, indicating two different crust bodies whose boundary approximately coincides with the north-south seismic belt. The West Kunlun-Aerjin deep break divides the western crust into the Qinghai-Tibet crust and the northwest crust, with a pronounced difference in crust thicknesses. Along the borders of the plate, there are large deviations from isostatic equilibrium.

7. We have made preliminary estimates of the lateral variations of the crust density and the upper mantle density. The range of variation of the average density is only a few percentage points, and is a mirror image of the crust thickness. The trend of the mantle density decreases from the east to the central region and then increases toward the direction of Tibet. The Tibet Plateau is a region of local maximum in mantle density.

9698
CSO: 4008/2

APPLIED SCIENCES

SIMPLE ERTS PHOTOGRAPH DIFFERENTIATION METHOD DESCRIBED

Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 7 No 10, Oct 81 pp 32-34

[Article by Huang Letian [7806 2867 1131], Wang Tianji [3769 1131 0644], Lin Shiying [2651 0099 5391], Zhang Shichao [1728 0013 6389] of the Guangzhou Institute of Electronic Technology of the Chinese Academy of Sciences; "A Simple Way To Detect the Difference Between Two Photographs Taken by the Satellite ERTS." This article was received on 15 October 1979.]

[Text] Abstract: This article proposes a new method of detecting the difference between two photographs--the speckle image modulated by white light is regarded as the random carrier wave during optical information processing. Experiment proves this method will also effectively produce a high redundancy to code information of images. The results obtained are similar to those obtained by the method of using coherent light modulated speckle patterns proposed by Francon et al. But the method proposed here is simpler.

The procedures of the ordinary method of processing of optical information by the method of image frequency spectral subtraction is relatively complicated. In 1974, Francon proposed the use of modulated speckle patterns as the random carrier bodies to process optical information in detecting differences between two photographs(1), thus simplifying the procedures of the ordinary method of processing optical information by the method of image frequency spectral subtraction. He successfully detected the differences between two photographs of the earth's surface taken at two different instants by the ERTS satellite.

The method proposed and the experiment described in this article are improvements of the method by Francon using coherent light modulated speckle patterns. Using white light patterns in processing further simplifies the procedures of the method of Francon.

Let the same parts of two photographs be designated by A, and the different parts be designated by B and C. First place the first photograph (A + B) over a photographic film P and expose it to white light. Then, place the second photograph (A + C) over the original position of the first photograph and translate the position of the film already exposed to (A + B) along the direction perpendicular to the ξ axis of the incident light to ξ_0, the magnitude of

ξ_0 is several dozen microns, then use white light for a second exposure. Thus, the total recording on the film P by the two exposure can be written as

$$
\begin{aligned}
&(A+B)\circledast\delta\left(\xi+\frac{\xi_0}{2},\eta\right)\\
&+(A+C)\circledast\delta\left(\xi-\frac{\xi_0}{2},\eta\right)\\
&-A\circledast\left[\delta\left(\xi+\frac{\xi_0}{2},\eta\right)+\delta\left(\xi-\frac{\xi_0}{2},\eta\right)\right]\\
&+B\circledast\delta\left(\xi+\frac{\xi_0}{2},\eta\right)\\
&+C\circledast\delta\left(\xi-\frac{\xi_0}{2},\eta\right).
\end{aligned}
\tag{1}
$$

where ξ, η are the coordinates of the film P in the plane.

After linear treatment, the film P exposed twice is placed on the front focal plane of the lens 0_1 in the optical system shown in Figure 1. It is then illuminated by a parallel beam of laser. The amplitude of transmittance t can be written as

$$
\begin{aligned}
t=a-bA\circledast&\left[\delta\left(\xi+\frac{\xi_0}{2},\eta\right)\right.\\
&\left.+\delta\left(\xi-\frac{\xi_0}{2},\eta\right)\right]\\
&-bB\circledast\delta\left(\xi+\frac{\xi_0}{2},\eta\right)\\
&-bC\circledast\delta\left(\xi-\frac{\xi_0}{2},\eta\right).
\end{aligned}
\tag{2}
$$

where a, b are constants. Therefore, on the plane of frequency spectra (i.e., the rear focal plane of the lens 0_1), the distribution of the amplitude should be proportional to the Fourier transform $\mathscr{F}\{t\}$ of t. From equation (2) we obtain:

$$
\begin{aligned}
\mathscr{F}\{t\}=a\delta(u,v)-b[2\mathscr{F}\{A\}+\mathscr{F}\{B\}&\\
+\mathscr{F}\{C\}]\cos\left(\frac{\pi u\xi_0}{\lambda}\right)&\\
-ib[\mathscr{F}\{B\}-\mathscr{F}\{C\}]\sin\left(\frac{\pi u\xi_0}{\lambda}\right)&.
\end{aligned}
\tag{4}
$$

where u, v are spatial frequencies. $\mathscr{F}\{A\}$, $\mathscr{F}\{B\}$ and $\mathscr{F}\{C\}$ respectively correspond to the frequency spectra of A, B and C. The first term on the right side of the equation corresponds to the bright speckle at the center of the focal point of the lens 0_1, i.e., the geometric image of the light source which

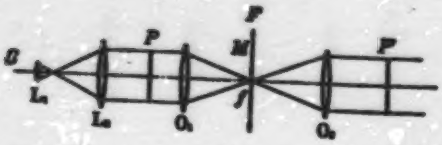


Figure 1. Optical Information Processing System To Detect the Differences Between Two Photographs

Key: S--laser source;
P--photographs being scrutinzed;
P'--conjugate plane of P;
L_1, L_2--collimation system;
O_1, O_2--transformation lens;
F--common focal plane of O_1, O_2;
M--filter of Young's fringes.

does not include the frequency spectra of the two photographic images. The second and third terms on the right side of the equation are equivalent to the frequency spectra modulated by two sets of complimentary Young's interference fringes.

Let us now consider the following two cases:

1. If the two photographs are entirely the same, for example, photographs of the same set of white light, then $B = 0$, $C = 0$, the third term on the right side of equation (4) does not occur, therefore Young's fringes corresponding to the second term is the clearest. Like the ordinary method, the directions of relative displacement of the direction of the fringes and the image of the fringes are perpendicular to each other, the space between the fringes and the amount of relative displacement of the image are inversely proportional.

2. By placing a narrow spatial wave filter to allow the smallest part of the fringes to pass, we obtain a frequency spectrum after filtering written as follows

$$-b[\mathcal{F}\{B\}-\mathcal{F}\{C\}].$$

Then we perform an inverse transform through the lens O_2 and we obtain the difference 1 B - C 1 between the two different parts of the two photographs on the P' plane.

If the second photograph is a part of the first photograph, i.e., $C = 0$, then the difference B between the two photographs can be obtained on the plane P'.

In Figure 3, (a) and (b) were photographs of a certain region taken by the satellite (one of the photographs had been processed) used to simulate two images taken at different times. (c) is the difference between the two

Figure 2. Photograph of the Actual Experimental Setup.

图2 实际的实验装置照片

Figure 3. Satellite Photographs and the Photograph of the Difference Detected

The bright spot shown in (c) indicates the difference between (a) and (b)

(a)

(b)

(c)

photographs obtained by frequency spectral wave filtering and inverse transformation. Because the wave filter used in the experiment was not ideal enough, the frequency spectra of a very small area still passed through but the difference between (a) and (b) can still be clearly seen.

Worth careful notice in the experimental installation is the precise positioning of the photographs to be scrutinized and the control of appropriate displacement to produce Young's fringes which can be conveniently filtered. The selection of the collimating lens and the Fourier transform lens that produce the parallel light beam in the optical system for information processing are also worth attention. To assure the quality of the resulting photographs, the parallel light beam must be even, the diameter of the light beam must satisfy the demands of the dimensions of the photographs being scrutinized so that a diffracted image caused by dust must be eliminated as much as possible. The transformation lens should be a perfect lens that eliminates aberration. And $f_1 = f_2 = 1{,}000$ is ideal. In our experiment, because the lens used for the Fourier transform was not ideal enough, therefore aberration still occurred in the results.

REFERENCE

(1). S. Pebrus, M. Francon, P. Koulev; Nouv. Rev. D'Opt., 1974, 5, 153-168.

9296
CSO: 8111/072

BRIEFS

AUTO BEARINGS ENTERPRISE MANAGEMENT SEMINAR--A national management seminar of automobile bearings enterprises under the First Ministry of Machinebuilding was held at the First Motor VEhicle Plant in Changchun from 16 to 22 July 1981. Leaders of 31 key factories in the automobile bearings trade, 25 factories in other trades under the First Ministry of Machinebuilding, and concerned bureaus under the First Ministry of Machinebuilding, totaling more than 120 persons, attended the meeting. Minister Rao Bin spoke at the seminar. The meeting primarily exchanged experiences in enterprise management and studied ways and means to raise the level of enterprise management, improve business administration, raise economic results, and make still greater contributions to the Four Modernization Program. At the meeting, representatives from the First and Second Motor Vehicle Plants, Beijing Motor Vehicle Plant No 2, Changsha Automobile Electrical Equipment Plant, Harbin Gear Plant, Nanjing Machine Tool Plant No 2, and the Shanghai Pengpu Machinery and Equipment Plant exchanged experiences in enterprise management. They also visited the First Motor Vehicle Plant and held extensive discussions. [Beijing QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 9, 1981, Inside Front Cover]

LASER OPTICAL FIBER TELEPHONES--Beijing's first laser fiber optics telephone communications testing system began serving daily telephone calls on 23 February of this year. For 5 months, it has been operating 24 hours a day and the system has not been interrupted, the telephone sound is clear and loud, and the users are satisfied. Laser optical fiber telephone communications is a telecommunications technology that developed during the 1970's. The optical fiber telephone involves the use of light waves to replace electrical waves and transmitting information through a glass fiber. A glass fiber thinner than a human hair can handle up to 10 million ordinary telephone line conversations, the properties are reliable, the ability to resist interference is strong, the quality of sound is good, the secrecy is good, and the use of optical fibers conserves copper materials. In recent years, this new technology is being researched and developed competitively internationally, but at present, only a few nations have reached the level of applicability. [Text] [Beijing RENMIN RIBAO in Chinese 6 Aug 81 p 3] 9296

4008/463

TABLE OF CONTENTS OF 'HUAXUE XUEBAO' VOL 39 NO 4, 1981

Shanghai HUAXUE XUEBAO [ACTA CHIMICA SINICA] in Chinese Vol 39 No 4, Aug 81 p 382

[Text]

Adsorption from Solutions. V. Adsorption of Benzoic Acid from Mixed Solvents of Carbon Tetrachloride, Benzene and Ethyl Alcohol by Sugar Charcoal and Silica Gel......Zhang Zhijing [1728 0037 2490], Chemistry Laboratory, Beijing Aeronautics; Gu Tiren [7357 1912 0086], Department of Chemistry, Beijing University (287)

The Harmoniousness of Carrier Waves and the Calculations of Angular Frequencies and Joint Coefficients......Li Xiangping [2621 0686 1627], Beijing Institute of Technology (293)

The Microenvironmental Effects of the Helical Conformations of Amylose and Its Derivatives. 1. The Inclusion of the Substrates Carrying a Hydrophobic Long Hydrocarbon Chain with Sodium Carboxymethylamylose as the Host......Hui Yongzheng [1920 3057 2973] and Gu Jianhua [7357 1696 5478], both of Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (309)

The Crystal Structure of Ag_2ClNO_3......Zhou Gongdu [0719 0361 1653] and Wu Bomu [0124 0130 3668], both of the Department of Chemistry, Beijing University (319)

Spectrophotometric Study of the Reaction of *meso*-Tetra-(3-*N*-methylpyridyl) Porphyrin with Lead......Tong Shenyang [4547 3088 7122], Wang Lianyou [3769 6647 0645] and Fan Jie [2868 2638], all of the Department of Chemistry, Beijing University (327)

Quantitative Analysis of Inseparable Peaks in Chromatography ......Huang Junxiong [7806 7486 7160], Liu Xiufen [0491 4423 5358] and Liu Peng [0491 7720], all of the Institute of Environmental Chemistry, Chinese Academy of Sciences, Beijing (335)

Notes

Studies of Color Reactions of Polycomponent Complex I. Rare-earth Ions-Chromazurol S-1, 10-Phenanthroline-cetyl-trimethyl

Ammonium Bromide System......Ci Yunxiang [1964 0061 4382], Beijing University; Hu Keren [5170 0668 0086], Liu Zhonghua [0491 1813 5478] and Wen Lijian [2429 0500 1696], all of Beijing Institute of Rare-earth Metals (341)

Studies on the Application of Elemento-organic Compounds of the Fifth and Sixth Groups in Organic Syntheses. IX. Reactions of Cyanomethylene Triphenyl-arsorane with Ketones...... Huang Yaozeng [7806 5069 2582], Xing Yide [6717 1355 1795] and Shi Lilan [2457 5461 5695], et al., all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (348)

Synthesis of Perfluoro-2-methyl-3-oxa-glutaric Acid and Its Derivatives......Ma Jingji [7456 2417 7535], Xu Yishuang [1776 0110 7208], Wang Jiusi [3769 0046 1835] and Huang Yaozeng [7806 5069 2582], all of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (354)

The Synthesis of a Prostaglandin Intermediate--2-(6'-Methoxycarbonylhexyl)-cyclopent-2-en-1-one......Liu Zhiyu [0491 1807 3558] and Han Weiping [7281 5898 1627], both of the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (358)

Theoretical Examinations of Ligand Buffer Solutions...... Zhao Zaofan [6392 5679 5672], Chemistry Department, Wuhan University (362)

Studies on Analysis of Metabolites of Pesticides. II. Isolation and TLC of 5-Chloroanthranilic Acid in Urine......Du Xiguang [2629 6932 0342] and Li Dingjun [2621 1353 0193], both of Zhejiang Medical College, Hangzhou; Mao Zhixiang [3029 1807 5046], Liu Zhijiang [0491 1807 1730], et al., all of the Pesticide Laboratory, Zhejiang Medical College, Hangzhou (367)

Stability Constants and Molar Extinction Coefficients of $[Fe(SCN)_n]^{3-n}$ Complexes in 25 percent Alcohol (v/v) Solution at 0°C......Chen Lianshan [7115 6647 1472] and Zhao Honggang [6392 3163 0474], both of the Department of Chemistry, Liaoning Teachers College, Dalian; He Zhonglin [0149 6945 2651], et al., Department of Chemical Engineering, Dalian College of Light Industry (371)

Communications

The Microenvironmental Effects of the Helical Conformations of Amylose and Its Derivatives. 2. Catalytic Effects of Sodium Carboxymethylamylose on the Hydrolysis of Various Carboxylic

Esters of *N*-Alkyl-3-hydroxypyridinium Iodide......Hui Yongzheng [1920 3057 2973], Gu Jianhua [7357 1696 5478] and Jiang Xikui [5592 6932 1117], all of Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences (376)

9717
CSO: 4008/9

APPLIED SCIENCES

CONFERENCE HELD ON RADIOACTIVE ENVIRONMENTS IN MINES

Hong Kong ZHONGGUO XINWEN in Chinese 14 Jul 81 p 3

["China's Research into Radioactive Environments in Mines Progresses"]

[Text] Beijing, 13 July--Researchers into radioactive environments in mines have launched massive scientific research in uranium mines and mines with associated radioactive minerals and have realized outstanding results.

The first national academic discussion conference on radioactive environments in mines was held in Beijing at the end of June and the beginning of July. It received 103 papers which show that China's scientific research into radioactive environments in mines has achieved welcome progress in the following four aspects:

The problem of ventilation to exhaust radon and the problem of controlling radioactive pollution in uranium pits and non-uranium pits of different types have been solved, and comprehensive measures have been developed which are suitable for the actual situation in China for ventilation, sealing and control of radon which has separated out. In particular, the method of pressurized ventilation has been used: under a reduction of two-thirds in the amount of air, the concentration of radon was lowered by over 90 percent.

Some new methods and instruments to monitor and measure radon have been developed. The quick radon measurement by balloon has already been widely popularized and applied.

A group of new types of coating materials to guard against radon have been developed. Plastic for preventing radon from separating out has an efficiency of over 83 percent.

Profound exploration has been conducted into the cause of occupational diseases in mines. The viewpoint of a compound effect of such harmful substances as radon and arsenic upon the human body has been proposed. It has great practical meaning and theoretical value.

One hundred and eleven scientific and technical workers attended this academic discussion meeting. The director of the Chinese Nuclear Society and vice minister of the Second Ministry of Machine Building, Wang Ganchang [3769 3227 2490], came to the meeting and spoke.

9296
CSO: 4008/463

AUTHOR: MO Bozhi [5459 0130 3112]
et al.

ORG: None

TITLE: "Tourists' Hotels with Courtyards"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 9, 1981
pp 1-8

TEXT OF ENGLISH ABSTRACT: This article treats small hotels for tourists with courtyards built in Guangdong in recent years with respect to the following points:
1. In addition of meeting the general requirements, different functional components of these hotels are arranged according to the principles of landscape gardining. Four types of arrangements are mentioned in the article.
2. Circulation in these hotels is considered to give variation in vistas to give more enjoyment to the tourists.
3. Elements smaller in mass are more appropriate for forming architectural combinations with emphasis on the character of each.

AUTHOR: WAN Zhongying [8001 6945 5391]
et al.

ORG: None

TITLE: "Refreshment Pavilions in Scenic Spots"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 9, 1981
pp 9-16

TEXT OF ENGLISH ABSTRACT: Buildings serving refreshments in scenic spots and parks should add interest to the scenery in addition to meeting the physical requirements. The location of these buildings should be considered in the planning of the scenic spot as a whole and the form treated as a center of interest. The characteristics of the natural environment should be taken advantage of. As the number of visitors varies considerably in different seasons, flexibility in the serving facilities should be noted. Particular local colors should be emphasized in the architectural treatments.

AUTHOR: ZHENG Zuliang [6774 4371 5328]
et al.

ORG: None

TITLE: "Refreshment Compounds in Cultural Park, Guangzhou"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 9, 1981 pp 24-28

TEXT OF ENGLISH ABSTRACT: The ground floor of a four-storied exhibition building in the Cultural Park, Guangzhou, is used for refreshment compounds, reception rooms, etc. The space is designed with culture as the leitmotif in accordance with the character of the park. In the treatment of the interior, principles of both Chinese traditional and foreign landscaping arts are applied with sculptural decorations and effects. The space is subdivided with variations in atmosphere and rhythm in modulation. Care has been taken to intermingle the indoor and outdoor spaces.

AUTHOR: LU Yuanding [7120 0337 7844]
et al.

ORG: None

TITLE: "Local Dwellings in Guangdong"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 9, 1981 pp 29-36

TEXT OF ENGLISH ABSTRACT: Traditional experiences in local dwellings in Guangdong are investigated and analyzed by the authors. With the basic element of planned one-bay, two-bay or three-bay arrangement, various combinations can be formed either by longitudinal or transversal extensions. The arrangement of the houses in the village usually follows a comb-shaped pattern, with the main alley in the direction of the summer winds. Pools are provided in the front and trees planted on the other sides. Ventilation and shading have been the main considerations. The hall is the main living space in the dwelling, which is usually open or partly open to the court. The disposition of the hall and court is centered around efficient ventilation and heat insulation. In addition to the function of lighting, ventilation and sewage, the court also aids in a better environment. Utilization of the terrain and treatment of details are also reviewed in the article.

AUTHOR: SHE Junnan [0152 3975 0589]

ORG: None

TITLE: "Enhancing the Level of Design"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 9, 1981
pp 46-48

TEXT OF ENGLISH ABSTRACT: The author proposes the following points to enhance the level of architectural design. Architects should specialize mainly according to types of buildings in view of training specialists, hastening the design process and enhancing the quality of design. Architects should grasp technical knowledge as well as dialectics, especially in proceeding from reality, singling out the principal contradictions and emphasizing the unity of the design as a whole. Efforts should be made in imagination and creation based on the function, material, economy, terrain and other factors, reflecting them instead of stereotyping.

9717
CSO: 4009/64

AUTHOR: QIAN Huanbin [6929 3562 6333]
FANG Xuechu [2455 7185 2806]

ORG: QIAN of Design Academy No 4, Ministry of Chemical Engineering; FANG of Hubei Provincial Chemical Fertilizer Plant

TITLE: "Verification and Treatment of Foundations of Expansive Soil"

SOURCE: Beijing GONGCHENG KANCHA [ENGINEERING SURVEYING] in Chinese No 5, 22 Sep 81 pp 43-47

ABSTRACT: The Hubei Chemical Fertilizer Plant is a large scale chemical fertilizer installation imported from the USA and Holland, having a modernized level of production of the 70's. The foundation of all the equipment components, such as pipes, instruments, the high speed compressor, the conversion furnace, etc. all require the settling to be absolutely less than 5mm. According to the data supplied by the Hubei Comprehensive Surveying Academy and the relatively complete geological surveying information, the location of the plant belongs to a region of expansion and contraction clay soil, and mainly contracting. Based upon the principle of individualized treatment, using locally available materials, the Design Academy No 4 of the Ministry of Chemical Engineering proposed a series of measures, including laying a cushion of sand, excavating all or some of the expansive and contracting soil and replacing it with nonexpansive soil or gravel, burying the foundation to a depth

[continuation of GONGCHENG KANCHA No 5, 81 pp 43-47]

of 1.5 to 2.5 m, adopting the technique of pressure counteraction, driving piers and adding beams to reduce contact between the foundation and the soil, using piles to transfer the structural load from the upper layer unstable soil to the stable soil of the lower layer, etc. A separate section of the paper, written by FANG, describes considerations in the arrangement of the various parts of the plant and their respective foundation treatment measures. Finally, FANG offers some suggestions in the place of the current practice of mainly using deep foundation and sand cushioning, which he believes to be not the optimal solution to the problem of expansive soil due to the increase in the cost of engineering and construction and the prolonged construction time.

6168
CSO: 4009/86

AUTHOR: HOU Baorong [0230 1405 2837]
HE Shijian [0149 1102 0313]

ORG: None

TITLE: "Homogenizing Tank of the Mixing Chamber"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 9, 10 Sep 81 pp 2-7

ABSTRACT: Homogeneity of the raw material directly affects the productivity, quality of products, heat consumption, and the wear of refractories of the dry method rotary kiln or the standing kiln. In order to improve the raw material homogenizing technique of China's dry method cement plants, the Handan Design Institute of Cement Industry began in 1977 to study the design of a continuous homogenizing tank. With the assistance of Xuzhou Bureau of Mines Cement Plant, a model experiment of a homogenizing tank of the mixing chamber (ø1.5 x 2.5 m) was completed early 1978. From Oct 78 to Jul 80, the 2 organizations jointly completed 2 industrial experiments of the homogenizing tank of the mixing chamber (ø10 x 20.5 m) to produce a relatively satisfactory homogenizing effect and various design parameters. In Sep 80, the Ministry of Construction Materials approved the results and permitted the design to be domestically extended. To date, more than 20 domestic cement plants have decided to adopt it and some of them have started to construct theirs. The work process, the structure, and the major installations are described.

AUTHOR: LIU Binwen [0491 2430 2429]

ORG: Experimental Laboratory, Xinjiang Weiwuer Autonomous Region First Construction Company

TITLE: "Property of Silicate Mixed Cement and Its Application in Construction"

SOURCE: Beijing SHUINI [CEMENT] in Chinese No 9, 10 Sep 81 pp 14-15, 9

ABSTRACT: Before 1963, the Xinjiang Cement Plant used 20-30 percent shale as the admixture to produce the No 400 mixed cement. Since then, for the purpose of improving the property and increasing the productivity, 40-45 percent of slag and shale have been used to form a complex additive to produce the mixed silicate cement, in which 1/3 being activated material and 2/3 inactive material. In these 2 decades, on the average, the First Construction Company has been using about 8000 tons of this type of cement every year. It has been extensively used to mix concrete of lower than No 250 and as a mortar mix. In the process of using it, it has been discovered that this cement has the following special properties: (1) Satisfactory early and late stage strength development; (2) Sensitive to the water ratio; (3) Effect of adding other additives (such as lignin calcium sulfonate) relatively poorer than ordinary cement; (4) Requiring more water and easier to mix. Gravel ratio to make concrete with this cement and the interrelationship between the strength of the cement and that of the concrete are explained.

6168
CSO: 4009/83

AUTHOR: LUO Jincheng [5012 7234 2052]

ORG: Shanghai Electric Meter Plant

TITLE: "SB802 Semiconductor Parameters Fast Testing Instrument"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 43-44

ABSTRACT: Ordinarily, about 5-10 parameters of a transistor must be tested; for small scale integrated circuit, there may be several tens. Several currently commonly used meters and graphic display instruments are of general purpose and low cost, but are also of low efficiency; only one parameter can be tested and read at one time. For the purpose of improving the testing efficiency, the Shanghai Electric Meter Plant designed the SB802 instrument. With a 9-inch television picture tube, it forms a display screen to produce the concrete data of more than 10 parameters of the semiconductor being tested so that all these parameters may be judged all at once. The instrument may also be used for graphic, instead of numerical, display to show in curves and waves the properties of the device being tested. The basic work theory and the major technical properties of the SB802 testing instrument are described.

AUTHOR: MA Yunjie [7456 0061 2638]

ORG: None

TITLE: "The CS-2 Ultrasonic Echo Depth Finder"

SOURCE: Shanghai DIANZI JISHU [ELECTRONIC TECHNOLOGY] in Chinese No 9, 20 Sep 81 p 8

ABSTRACT: Most recently, the Shanghai Ultrasonic Wave Instrument Plant succeeded in making the CS-2 ultrasonic echo depth finder. Intermediate integrated circuits and transistors made in China are used. When it is being operated, the ultrasound emitter, which is installed in the bottom of the ship, sends out ultrasonic wave perpendicularly toward the bottom of the water, and instantly, the depth of the water is shown on the display screen in numbers. The testing range of the instrument is 0.5 - 100 m and the precision is ± 1 percent and ± 0.1 m. In order that ships may navigate safely, the instrument is equipped with an automatic warning alarm. When the ship reaches points where the depth of the water is 0.5-3 m, the alarm is activated automatically.

6248
CSO: 4009/84

AUTHOR: XU Min [1776 2404]
TONG Dechun [0157 1795 4783]
SHI Xizhi [0670 5045 2535]

ORG: All of Shanghai Jiaotong University

TITLE: "Digital Spectral Analysis of Electroencephalogram (EEG)"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 1-13

TEXT OF ENGLISH ABSTRACT: Preliminary work in investigating the EEG with digital spectral analysis methods (power spectrum and power spectrum array) is presented in this paper. The principles of digital analysis methods, mathematical explanation and effectiveness of application are described in examples of intracranial space-occupying lesion caused by tumor and sleep-process control.

AUTHOR: QIAN Miaogen [6929 5375 2704]

ORG: Shanghai Jiaotong University

TITLE: "The Aging Characteristics of Cu-2 percent Be-0.30 percent Ni Beryllium Bronze"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 15-28

TEXT OF ENGLISH ABSTRACT: This paper investigates the aging characteristics of Cu-2 percent Be-0.30 percent Ni beryllium bronze which is widely used in China, especially the effect of the aging temperature and quenching grain-size, on discontinuous precipitation of alloys mainly using the metallographic method. The research shows that discontinuous precipitation is obviously observed when this alloy is aged at 320°C, the degree of precipitation depending considerably on the aging temperature and quenching grain-size. Moreover, a comparison has been made between the quantitatively metallography-measured value and the hardness data, which suggests that it is advisable that the amounts of grain boundary reaction for Cu-2 percent Be-0.30 percent Ni alloy be controlled within the range of 3-8 percent when aging at 320°C. The results of the research may serve as the processing foundations in aging this alloy, and suggest possibilities for improving the technology of beryllium bronze production in China. Finally, the applications of the above theory are described with the top twist wire as an example.

AUTHOR: WANG Shoutai [3769 1108 3141]
LIU Junbi [0491 6874 3880]

ORG: Both of Shanghai Jiaotong University

TITLE: "The Investigation of Dependence of Electrical Properties of Ship Cable on Water Absorption"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 29-45

TEXT OF ENGLISH ABSTRACT: In general, ship cables are used in humid-thermal conditions. Therefore, the water absorption properties are a significant problem for the users and manufacturers of the cables. This paper starts with the analysis of the water absorbing mechanism of rubber and plastics, followed by inspection of water immersion extraction of insulation of various rubber-and-plastic-insulated ship cables, and the determination of insulation resistance, capacitance, dielectric loss angle and breakdown voltage after immersion in water. It has been found that the variation of electric properties of ship cables depends on two relative but opposing factors: water absorption and extraction, while the capacitances vary regularly with the time for which they are immersed in water, its correlation approaching that of water absorption, and the correlation in rubber is better than that in plastics. Finally, methods for improving dielectrical properties after immersion in water have been suggested.

AUTHOR: HUI Zhikui [1920 1807 1145]
WANG Ai [3769 5676]

ORG: Both of Shanghai Jiaotong University

TITLE: "A Method of Computer-aided Analysis of SC Network"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 47-56

TEXT OF ENGLISH ABSTRACT: In this paper, a discussion of the computer-aided analysis of the switched capacitor (SC) network is presented. The discussion, based on the method of Y. P. Tsividis, includes presenting an algorithm and formulating programs. The two programs formulated by the authors correspond to arbitrary inputs and piecewise-constant inputs. Finally two practical SC circuits are analyzed with the help of a computer and the computational results are found to be satisfactory.

AUTHOR: SHEN Jiazhen [3088 1367 2823]
FAN Zuyao [5400 4371 1031]

ORG: Both of Shanghai Jiaotong University

TITLE: "The Bearing Capacity of Tension Field in Sheared Web"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 57-73

TEXT OF ENGLISH ABSTRACT: This paper is chiefly concerned with the ultimate shear bearing capacity of steel plate girder web varying with flange rigidity and web slenderness and aspect ratio. Based on the experimental results of a series of model tests on girders, with reference to the existing formula of other countries, the author has suggested an ultimate stage model of web in shear and the conception of effective width of tension field, leading to the formula of the bearing capacity of tension field. The calculated value coincides with the actual case quite well.

AUTHOR: MA Zhiliang [7456 1807 5328]

ORG: Shanghai Jiaotong University

TITLE: "Relative Suitabilities of Wave Theories for Structural Analysis of a Semisubmersible Platform"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 75-81

TEXT OF ENGLISH ABSTRACT: It is necessary to select a more suitable wave theory applicable for calculation of a wave velocity field in which a semisubmersible platform operates when structural analysis of it has to be performed. Generally a semisubmersible platform operates in a sea area of middle or deep water and the primary wave theories are Airy theory and fifth order theory. According to these two theories, velocity field calculations were made for a great number of different combinations of wave parameters and the results were analyzed. It is considered that the Airy is more suitable for engineering purposes.

AUTHOR: LIN Jieren [2651 2638 0086]
TAN Jiahua [6223 1367 5478]
GU Mintong [7357 2404 4547]

ORG: All of Shanghai Jiaotong University

TITLE: "A Study of the Approach of Searching the Optimum Ship's Principal Elements"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 83-96

TEXT OF ENGLISH ABSTRACT: In this paper, the approach to searching the optimum new ship's principal elements with the aid of a computer is described. The authors are fully aware that to develop this new technique the reliability of evaluating results must be improved. Therefore, with the improvement of reliability as the key problem, suitable procedures and preliminary methods for analysis of the involved parameter's sensitivity and errors of the results are given, and a new form for expressing the results is recommended. In this last part of the paper, an example is given for brief illustration.

AUTHOR: GU Yongqing [7357 3057 3237]

ORG: Shanghai Jiaotong University

TITLE: "Research in Using X-rays to Measure the Residual Stresses Layer-by-layer in Grinding"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 97-106

TEXT OF ENGLISH ABSTRACT: This paper discusses the use of X-rays to measure residual stresses in grinding by using different metal targets and changing the angles of incidence in a special attachment. Using X-rays, it is possible to detect residual stresses in various penetration depths of the metal surfaces ground without etching the layers of the surfaces as the usual processes required. The method is particularly suitable for the grinding process because the gradient of residual stresses in grinding is very sharp. The fact that measuring results (compressive stress) do not correspond to the real condition (tensile stress) is explained. The various values measured by employing different metal targets to the same specimen are also explained.

AUTHOR: WANG Chengtao [3769 2052 3614]
LI Zhuguo [2621 2691 0948]
DAI Wei [2071 0251]
et al.

ORG: All of Shanghai Jiaotong University

TITLE: "The Study of Journal Center Path of Internal Combustion Engine Bearing"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 107-124

TEXT OF ENGLISH ABSTRACT: This paper discusses several methods of calculation of journal center path of the internal combustion engine bearing, of which Holland's method is described and studied in particular detail. Some data and symbols in calculating procedures of Holland's method have been corrected and a common computer program has been developed for designing bearings of the IC engine in China.

The method, the "Four Vectors Method," based on the study of Holland's method, is suggested for the first time. The results of its solution approach the results of the solution of Hahn's method. Although Hahn's method is more exact in calculating results, it requires longer time consumption with the computer. Holland's method and the Mobility method are simpler and therefore more practical, and both methods

[Continuation of SHANGHAI JIAOTONG DAXUE XUEBAO No 3, Aug 81 pp 107-124]

are widely used in practice. In addition, applications of the journal center path to designing of the IC engine and the actual measurement method of journal center path are introduced.

AUTHOR: FAN Yuanwu [2868 0337 2976]

ORG: Shanghai Jiaotong University

TITLE: "The Calculating Methods of the Internal Short-circuit Currents in 12-Pulse Rectifier Circuits"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 125-136

TEXT OF ENGLISH ABSTRACT: The 12-pulse rectifier circuits are very important rectifier circuits. This paper describes the calculating methods of the internal short-circuit currents in these rectifier circuits. The author has worked out part of the theory.

AUTHOR: HU Yuda [5170 3022 6671]

ORG: Shanghai Jiaotong University

TITLE: "Multi-objective Optimization Methods"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 3, Aug 81 pp 137-147

TEXT OF ENGLISH ABSTRACT: This paper introduces some useful multi-objective optimization methods.

9717
CSO: 4009/43

AUTHOR: WANG Runwen [3769 3387 2429]
LEI Shizhan [7191 0099 3277]

ORG: Both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Radiation Spectrum of Relativistic Electrons in a Spatially Periodic Transverse Magnetic Field"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 8, Aug 81 pp 1-4

TEXT OF ENGLISH ABSTRACT: The motion track of relativistic electrons in a spatially periodic transverse magnetic field has been analyzed. Under some conditions, the electron motion is harmonic in the direction perpendicular to the original incident one. Radiation spectrum and spectral width have been obtained using harmonic mode, and the nonharmonic one is also discussed. It has been shown that the radiation spectrum depends on the initial electron velocity and the intensity of the magnetic field.

AUTHOR: SUN Kun [1327 1024]
SONG Keliang [1347 0344 5328]
BAO Shanfei [0545 0810 2431]
LI Weijun [2621 4850 0689]
LIU Shaokui [0491 1421 1145]

ORG: SUN, SONG and BAO all of Jilin University of Technology; LI and LIU both of Jilin Diesel Engine Factory

TITLE: "Investigation of Drilling with False Concentric Resonator of Changeable Energy"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 8, Aug 81 pp 26-30

TEXT OF ENGLISH ABSTRACT: At present, plane parallel resonator is often used in multipulse laser drilling with average distribution of pulse energy. We consider it disadvantageous in regard to accuracy, surface finishing and reproducibility for the drilled holes. Through analysis and experiments on output characteristics of resonators as well as rational distribution of pulse energy, improvement in accuracy, surface finishing and reproducibility of the drilled holes can be achieved, especially in improving their taper, by using the false concentric resonator with changeable energy.

AUTHOR: ZHA Guigen [2686 6311 2704]
LI Xindi [2621 2450 1229]
QIAN Jianming [6929 0494 2494]

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Pulsed Xenon Flashlamps and Filter Envelopes Made of Quartz Tubes and Their Use in Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 8, Aug 81 pp 39-44

TEXT OF ENGLISH ABSTRACT: In pulsed flashlamps and filter envelopes made of quartz tubes with appropriate thickness and proper concentration of doped rare-earth elements, such as cerium, europium, etc., UV radiation below 3500 Å is essentially eliminated, thus filter solution and yellow glass filter envelopes in solid state lasers can be replaced and the coloring of the laser material is prevented.

A comparison has been made among filtering characteristics of different filter materials and their efficiencies in repetitive pulse Nd:YAG lasers. Experimental results show that using doped quartz in Nd:YAG laser and Nd:glass lasers, laser efficiency can be increased by 25-100 percent, or even more.

9717
CSO: 4009/65

Machine Tool Research

AUTHOR: WANG Kexi [3769 0344 6932]

ORG: Machine Tool Research Institute, First Ministry of Machines

TITLE: "Development of Electromachining in China and Its Effect on the National Economy"

SOURCE: Beijing JICHUANG [MACHINE TOOL] in Chinese No 9, Sep 81 pp 18-20

ABSTRACT: Electromaching means using electric energy directly to a workpiece to effect removal of material to produce the desired shape. Broadly speaking, it includes, aside the commonly known electric spark machining and electrolytic machining, it also includes electron beam, laser, plasma, ultrasonic, electromagnetic forming, etc. methods. At present, however, the most extensively applied, here and abroad, remains the electric spark and the electrolytic machining techniques, which have had a history of development in China of nearly 30 years. According to incomplete statistics, today there are about 15,000 electromachining tools of more than 30 types in China. Of these, forming and perforating tools number 8000; electrode cutting tools 6000; electric spark tools 300; electrolytic grinding machines 500; and electrolytic processing machines 200. The theory, procedure, applications, and structure of electric spark and electrolytic machining tools are described. At present, the cost of an electrolytic processing tool is very high (about 2 to 3 hundred thousand yuan to construct one) the power consumption is great, and the work process is difficult to master. Problems and prospects of future development are discussed.

6248
CSO: 4009/82

AUTHOR: LI Wenqing [2621 2429 3237]

ORG: Department of Mathematics

TITLE: "On the Controllability of Infinite Dimensional Linear Systems"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 267-273

TEXT OF ENGLISH ABSTRACT: In this note, the following systems:

$$\dot{x}=Ax+Bu \qquad x(0)=x_0 \qquad (1)$$

$$\dot{x}=Ax+Bu+Cv \qquad x(0)=x_0 \qquad (2)$$

are discussed, where x denotes element of a Hilbert space H, A is a closed linear operator, u,v denote the elements of another Hilbert space H_C, which are control elements, $u(t)$, $v(t) \in L_2(0, t_1; H_C)$, B and C are bounded operators: B is called control operator and C is called compensator operator. In this note the following problem is discussed: if the system (1) is not controllable, under what conditions is the system (2) controllable? The problem is solved in terms of a mild solution to (2) by the following equation

$$x(t)=T(t)x_0+\int_0^t T(t-s)Bu(s)ds+\int_0^t T(t-s)Cv(s)ds \qquad (3)$$

[Continuation of XIAMEN DAXUE XUEBAO Vol 20 No 3, 1981 pp 267-273]

where $T(t)$ is the semigroup generated by A. The following theorem holds.

Theorem: Let A be a closed operator, $T(s)$ the semigroup generated by A, $x(t) \in C(0, t, H)$, H be a Hilbert space, $u(s)$, $v(s)$ belong to $L_2(0, t_1; H_C)$, H_C be another Hilbert space, and B and C be linear bounded operators. The necessary and sufficient condition for system (2) to be approximately controllable is that

$$\bigcup_{0<t\leqslant t_1} R(T(t)B)+\bigcup_{0<t\leqslant t_1} T(R(t)C)$$

is dense in the Hilbert space H, where $R(T(t)B)$, $R(T(t)C)$ represent the ranges of $T(t)B$, $T(t)C$ respectively.

In this note, the notions of the effective compensator and optimal compensator are discussed and two criteria are established.

AUTHOR: LUO Zhenhua [4382 2182 5478]

ORG: Department of Mathematics

TITLE: "The Distribution of the Random Flow Quantities in PERT"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 198. pp 274-289

TEXT OF ENGLISH ABSTRACT: The distribution of the random flow quantities η of an event in PERT was studied by Grubbs, Donaldson, MacCrimmon and Ryavec with Beta distribution. However, in order to express the mean and standard deviation of this distribution by $E_\eta = 1/6(a + 4m + b)$ and $\sqrt{D_\eta} = 1/6(b - a)$, it is necessary and sufficient that $p = 3 \mp \sqrt{2}$, $q = 3 \pm \sqrt{2}$ or $p = q = 4$ in Beta density function $p(x) = \frac{(x-a)^{p-1}(b-x)^{q-1}}{(b-a)^{p+q-1}B(p,q)}$, where a, b and m are the optimistic, pessimistic and most likely estimation of the flow quantities, respectively. In this paper, a concentrated normal distribution function is introduced and the above-mentioned distribution of the random flow quantities in the sense of approximation is treated, whereby a set of the most likely flow quantities is obtained, which is required by the projectors of PERT.

AUTHOR: WANG Shitie [3769 1102 6993]

ORG: Department of Mathematics

TITLE: "The HOI Resolution and HOL Resolution in Horn Set"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 290-296

TEXT OF ENGLISH ABSTRACT: In this paper, the OI resolution in Horn Set, which is called the HOI resolution, is proved. It is not only complete for Horn base clauses set, but also complete for the set of general Horn clauses.

AUTHOR: CAI Jingqiu [5591 4842 3808]

ORG: Department of Mathematics

TITLE: "Negative Hyper Ordered Resolution Principle"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 297-304

TEXT OF ENGLISH ABSTRACT: In this paper, first the basic idea of the semantic resolution principle is discussed, then a new semantic resolution principle, the negative hyper ordered resolution, is introduced. In this new resolution, the interpretation I is restricted to the most natural form (i.e., no negative sign is contained in I), and the order of the predicates in the clause is defined by the ordered clause idea. This new resolution is complete in the first-order predicate calculation, but the familiar ordered resolution (OI-resolution) is not complete in the proposition calculation.

AUTHOR: LIU Ruitang [0491 3843 1016]
CHEN Zhenxiang [7115 2182 3276]
SUN Shunong [1327 2579 6593]

ORG: All of the Department of Physics

TITLE: "Luminescent Properties of ZnS:Er^{3+} AC Electroluminescent Thin Film"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 305-311

TEXT OF ENGLISH ABSTRACT: In order to study the luminescent behavior of rare-earth impurities in ZnS, ZnS thin films doped with pure erbium metal were fabricated. The emission spectra, brightness-voltage characteristics and polarization effect of the films have been observed. It is of interest to note that although Er^{3+} are different in lattice environment, the structure of their spectra is nearly the same, whereas the relative peak values are different. The observed brightness-voltage relations and polarity phenomena support the point of view of impact excitation and polarization field effect. To explain the experimental results it is suggested that there are more than one kind of electron trap with different trap depths.

AUTHOR: JIANG Bingxi [3068 3521 3356]
ZHOU Bizhong [0719 1801 1813]
LIN Xiuhua [2651 4423 5478]

ORG: All of the Department of Physics

TITLE: "Investigation of the Specificities of Nitrogen-doped Epitaxial GaP Layers"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 312-319

TEXT OF ENGLISH ABSTRACT: An investigation has been made of the influence of growth conditions upon the morphology, growth rate, dislocation density, saucer pit density, nitrogen concentration and minority carrier lifetime of epitaxial GaP layers. It is shown that the nitrogen concentration and the minority carrier lifetime in the epilayer increase with increasing temperature of initiating growth. The nitrogen concentration in the epilayer grown at 1037-980°C using GaN or the nitrogen source was not increased beyond the level of $5.6 \times 10^{17} cm^{-3}$. In the epilayer grown at 995-900°C on the IEC GaP substrate ($\tau_m \approx 5ns$), the minority carrier lifetime has been estimated to be ~130 ns. The dislocation density does not vary and the saucer pit density decreases by a factor of 10 in the epilayer as compared with that in the substrate. The experimental results are analyzed.

AUTHOR: HONG Liangji [3163 5328 1015]
LIU Zhaohong [2692 0340 3163]

ORG: Both of the Department of Physics

TITLE: "Photovoltaic Effect of ZnS:Cu, Cl, Er DC Electroluminescent Thin Film"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 320-325

TEXT OF ENGLISH ABSTRACT: Some erbium-doped ZnS thin films exhibit both DC electroluminescence and photovoltaic effects. It was observed that there exist certain interesting relations between these two phenomena. Hence, the study of photovoltaic effects might be helpful in understanding the mechanism of electroluminescence.

AUTHOR: YU Naimei [0151 0035 2734]
LI Dee [2621 1795 1230]

ORG: Both of the Department of Chemistry

TITLE: "The Relationship between the Phase Structure and Properties of Polytetrafluoroethylene (PTFE) and Poly (p-hydroxybenzate) (Ekonol) Blends"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 326-336

TEXT OF ENGLISH ABSTRACT: In this paper, the variation of friction, wear, elongation of break, tensile strength and impact strength of the PTFE/Ekonol blends with composition is determined. A polarizing microscope and DTA are used to study the phase structure of the composite. Some regularities of the relationship between the structure and properties have been obtained. Under unlubricated conditions, a model of the wear mechanism and a relationship of the form,

$$\frac{\omega_1 \delta_{1C}}{d_{1C}} = 0.40\left(\frac{\omega_1}{d_1} + \frac{\omega_2}{d_2}\right),$$

for calculating a minimum wear rate of the PTFE composite are proposed.

AUTHOR: LI Dee [2621 1795 1230]
ZHANG Jinliu [1728 6855 2692]

ORG: LI of the Department of Chemistry, Xiamen University; ZHANG of Vinylon Factory, Fujian

TITLE: "A Simple GPC Method Used in the Determination of the Polymerization Degree Distribution and the Fraction Concentration of PVAc and PVA"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 337-346

TEXT OF ENGLISH ABSTRACT: The conditions of wavelengths, precipitation agents and the amount used, color developing agents and the amount used, concentration of polymers and reaction time in the turbidimetric and colorimetric methods were carefully studied. The results obtained were quite satisfactory in repeatability and reliability. This method can be used not only in the detection of the fraction concentration of PVAc and PVA, but can also be extended to use in the detection of the fraction concentration of other polymers.

AUTHOR: HUANG Huiliang [7806 2585 5328]
YANG Sunkai [2799 1327 2818]

ORG: Both of the Department of Chemistry

TITLE: "Rapid Polarograph Type 75-4B and Its Application"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 347-353

TEXT OF ENGLISH ABSTRACT: This is a new device for electrochemical analysis. Made up of integrated circuits, the apparatus is stable in quality. Apart from those properties common to all polarographs, it has the following outstanding features:

The apparatus is small, light, portable and durable. The power consumption is low. Electrolytic cell is in common use for both the two-electrode and three-electrode system. In addition, to eliminate the poisonous effect resulting from the use of large quantities of mercury, a mercury film electrode has been used as a substitute for the ordinary dropping mercury electrode. It is excellent in reproducibility. Thus the working condition is improved. It also allows for a wider range of concentration of the solute to be determined polarographically.

It is used to analyze micro amounts or traces of metal impurities detected in mineral materials, alloys, chemical products, chemical reagents, water, soils and medical compounds. It can also be used in electrochemical research work.

AUTHOR: WU Yuduan [0702 3842 4551]
CHEN Cimei [7115 1964 5019]
CHEN Yuwang [7115 0060 2598]
et al.

ORG: All of the Department of Oceanography

TITLE: "Indicator of the Degree of Heavy Metal Pollution in Natural Aquatic Environment--Distribution Ratio of Heavy Metals in Different Phases of Sediment"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 354-361

TEXT OF ENGLISH ABSTRACT: Based on the geochemistry theory and data from our field observation of the transportation of heavy metals in aquatic environments, we suggest that the distribution ratio of heavy metals in different phases of sediment should be used as an indicator in evaluating the degree of heavy metal pollution in the natural aquatic environment.

Heavy metals in unpolluted aquatic environment were mainly distributed in the crystalline phases of the sediment, while in the polluted environment they were chiefly distributed in acid soluble and organic phases of the sediment. Sediment index q may be defined as follows:

$$q = \frac{\Delta F}{F^{\circ}} = \frac{F-F^{\circ}}{F^{\circ}} .$$

[Continuation of XIAMEN DAXUE XUEBAO Vol 20 No 3, 1981 pp 354-361]

We have studied and analyzed the distribution ratio of heavy metals in different phases of sediment of the Changjiang River estuary and the Yang River zone water of Guanting Resource, and made a comparative analysis of the data of investigation on the Amazon River and the Yukon River as well as the How River. As a result, we have confirmed the reliability of the indicator.

AUTHOR: LUO Huiming [5012 2585 2494]
HUANG Houzhe [7806 0624 0772]

ORG: LUO of the Department of Oceanography; HUANG of the Department of Biology

TITLE: "Preliminary Investigation of the Food Ingestion and Absorption of Penaeus Larvae (*Penaeus penicillatus* Alcock)"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 362-372

TEXT OF ENGLISH ABSTRACT: The food ingestion and absorption of the zoea and mysis larvae of *Penaeus penicillatus* were investigated with ^{35}S(^{35}S-Methionine) labelling technique and the following results were obtained.

At zoea-I stage, *P. penicillatus* larva is a phytophagous feeder. The food habit begins to change during the zoea-II stage. At the zoea-III stage the animal is a mixfeeder, and when the animal emerges as mysis, it appears to be predatory.

Using labelled *Chaetoceros sp.* as foodstuff, it was found that the filtering rate of the zoea decreases with the raising of the diet density up to the level of 10^4 cells/ml, and remains at that level in raising the diet density still further. The feeding rate on *Chaetoceros sp.* and the predatory rate on the nauplius of *Artemia salina* increase with the raising of the diet density, and remain at that

[Continuation of XIAMEN DAXUE XUEBAO Vol 20 No 3, 1981 pp 362-372]

in increasing the density still further. For Penaeus larva, the utilizable proportion of the food decreases with the raising of the diet density, and remains at a lower level in further raising of the density.

The intensities of the ingestion and absorption increase markedly with the development of the larva., It seems that superfluous feeding may appear in diet density higher than the optimal level.

AUTHOR: XU Zhenzu [6079 2182 4371]
ZHANG Jinbiao [1728 6855 2871]

ORG: XU of the Department of Oceanography, Xiamen University; ZHANG of the Third Institute of Oceanography, National Bureau of Oceanography

TITLE: "On the Hydromedusae from the Continental Shelf Waters of the Northern Part in the South China Sea"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 373-382

TEXT OF ENGLISH ABSTRACT: In the present paper, samples of hydromedusae were collected monthly from the continental shelf of the northern part of the South China Sea (110-117°E, north of 18°30'N) during February 1978 to January 1979. A total of 690 plankton samples were analyzed and 64 species of hydromedusae were identified, of which 23 species belong to Anthomedusae, 26 to Leptomedusae, 1 to Limnomedusae, 9 to Trachymedusae and 5 to Narcomedusae.

All of the species identified are enumerated in this article. Of these, *Euphysilla pyramidata* Kramp, *Gotoea typica* Uchida, *Koellikerina octonemalis* Mayer, *Pandeosis ikarii* Uchida, *Phialidium malayense* Kramp, *Cirrholovenia tetranema* Kramp, *Petasiella asymmetrica* Uchida, *Amphogona apicata* Kramp aud *A. pusilla* Hartlaub are recorded for the first time from the China Sea. The principal morphological characteristics of the above species are described and illustrated.

AUTHOR: ZHOU Ji [0719 3444]
CHEN Xile [7115 0823 2867]

ORG: Both of the Research Office of Dialectics of Nature

TITLE: "On the Position of Anthropology in the System of Scientific Classification"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 383-390

TEXT OF ENGLISH ABSTRACT: In this paper, we consider anthropology to be a large basic subject, a bridge passing from natural science to social science and a group of subjects including many branches, because the movement of mankind is one of the forms of basic material movement in the material world, the formation of the transition from nature to society. Therefore, anthropology occupies a considerable position in the system of modern scientific classification. It cannot be replaced by any others.

AUTHOR: WU Hanchen [0702 3352 5256]

ORG: Mining Machinery Plant of Zhenjiang

TITLE: "The Total Volume for the Set of Cosets $\{o^+\}$"

SOURCE: Xiamen XIAMEN DAXUE XUEBAO [JOURNAL OF NATURAL SCIENCE, XIAMEN UNIVERSITY] in Chinese Vol 20 No 3, 1981 pp 391-393

TEXT OF ENGLISH ABSTRACT: Let $\{o^+\}$ be the set of the left cosets of the real orthogonal group of determinant +1 with respect to its subgroup [±1, ..., ±1]. The author calculates the total volume of $\{o^+\}$ and obtains:

$$V\{o^+\}=\int\cdots\int_{\{o^+\}}\{\dot{O}^+\}=\pi^{\frac{n(n+1)}{4}}\frac{1!\,3!\,5!\cdots(2n-3)!}{1!\,2!\cdots(n-2)!\,\Gamma\left(\frac{n}{2}\right)\Gamma\left(\frac{n+1}{2}\right)\cdots\Gamma\left(\frac{2n-1}{2}\right)}\cdot$$

As an application of this result the author obtains the value of the following multiple integral:

$$\int\cdots\int_{\pi\geqslant\theta_1\geqslant\cdots\geqslant\theta_n\geqslant-\pi}\prod_{1\leqslant\nu\leqslant\mu\leqslant n}|e^{i\theta_\nu}-e^{i\theta_\mu}|\,d\theta_1\cdots d\theta_n=$$

[Continuation of XIAMEN DAXUE XUEBAO Vol 20 No 3, 1981 pp 391-393]

$$=2^{\frac{n(n+1)}{8}}\frac{\Gamma\left(\frac{n}{2}\right)}{\Gamma(n)}\frac{\Gamma\left(\frac{1}{2}\right)\Gamma\left(\frac{2}{2}\right)\Gamma\left(\frac{3}{2}\right)\cdots\Gamma\left(\frac{2n-1}{2}\right)}{1!3!5!\cdots(2n-3)!}.$$

9717
CSO: 4009/48

AUTHOR: LI Shichun [2621 0013 2797]
LIN Zuxiang [2651 4371 9076]

ORG: Both of the Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Phase Relationship and Ionic Conduction of Li_4GeO_4-Zn_2GeO_4 System"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 253-257

TEXT OF ENGLISH ABSTRACT: The phase relationship and ionic conduction of Li_4GeO_4-Zn_2GeO_4 system, and the stability and synthesis of the intermediate phases were studied. Found in this system were the compound Li_2ZnGeO_4 and a solid solution $Li_{4-2x}Zn_xGeO_4$ with x in the latter range from 0.25 to 0.50. The solid solution, which has the composition of $Li_{14}Zn(GeO_4)_4$, has the highest conductivity. It also has a low sintering temperature and can be prepared with ease. However, $Li_{14}Zn(GeO_4)_4$ solid solution, being very sensitive to CO_2 and H_2O, is unstable in air.

AUTHOR: WEN Tinglian [3306 1694 8834]
CHEN Mengda [7115 1322 6671]

ORG: Both of the Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Effects of Sintering and Annealing on the Sodium Ion Conductivity and the Microstructure of β''-alumina"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 258-264

TEXT OF ENGLISH ABSTRACT: In the processing of β''-alumina ceramics, which have a starting composition of 9.6 percent Na_2O, 0.72 percent Li_2O, and 89.68 percent Al_2O_3 by weight, the effect of a temperature rise program on the ceramic densification was investigated. The effects of sintering and annealing schedule on the sodium ion conductivity and the microstructure of β''-alumina ceramics were also studied. After a fast firing and holding at 1600°C for five minutes and then being subjected to a moderate annealing below 1510°C for four hours, almost fully converted β''-alumina ceramics with density exceeding 98 percent of the theoretical value have been obtained. This has a relatively uniform microstructure with an average crystal size of 20~30μm. Its sodium ion resistivity is about 6.5Ω·cm at 350°C. A conductivity activation energy of 5.63 kcal/mol has been determined over the temperature range from 275-420°C.

AUTHOR: CHEN Shouliu [7115 1343 0362]

ORG: Institute of Acoustics, Chinese Academy of Sciences

TITLE: "Method and Program of Determination of Dielectric, Piezoelectric and Elastic Complex Coefficients Matrix of Piezoelectric Ceramics"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 265-275

TEXT OF ENGLISH ABSTRACT: The matrix of dielectric, piezoelectric and elastic complex coefficients of piezoelectric ceramics fully characterizes the electromechanical properties of piezoelectric ceramics. However, by traditional methods, such as the IRE standard method or IEC recommended method, such coefficients cannot be completely determined. A computer program by the iterative method based strictly on a theoretical formula has been designed to meet this purpose. All of the real and imaginary parts of the coefficients relevant to the electromechanical properties of piezoelectric ceramics have been successfully determined when the admittance values (or impedance values) were measured at three suitable frequency points on admittance loop (or impedance loop) for four standard resonators separately.

AUTHOR: LI Xiangting [2621 7449 1656]
GUO Zhukun [6753 4376 1507]

ORG: Both of the Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "EPMA Study on Sodium Deposition in β-alumina"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 276-278

TEXT OF ENGLISH ABSTRACT: The sodium deposition in β-alumina ceramics has been investigated by means of EPMA which provided a method for combining the sodium deposition process with simultaneous analysis of the sodium content. Measurements performed on samples with or without conductive coating film showed that the sodium content at the points bombarded by electron beams increased with the time of bombardment. For the samples without conductive coating, the counting rates of NaK_{α} X-rays were higher and appeared to fluctuate. This phenomenon was explained as being caused by the charge that had accumulated at bombarded points, thus leading to a drift of the electron beam. The NaK_{α} counting rate curves during sodium deposition and the secondary electron image at the deposition point as well as the NaK_{α} X-ray scanning image at the surface of samples after sodium deposition are given.

AUTHOR: FAN Shiji [5400 0013 7456/6259]

ORG: Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Precipitation Phase Changes in Single Crystal of Lead Molybdate"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 279-284

TEXT OF ENGLISH ABSTRACT: In the present paper, precipitation phase changes in single crystal of lead molybdate are being discussed for the first time. Morphology and space distribution of precipitated phases have been investigated. The typical precipitated phase was found to be of wafer-form (plate-shaped) consisting of a blue-green center with two transparent side flanks lying on the {101} face. The precipitation process under high temperatures first underwent three successive stages: by the order of scattering centers with sizes of some hundred or thousand Å, "spot-form" phases of 1 μm in size and the typical wafer-form phases. If subjected continuously to high temperatures, the more complex diffusion phase changes will take place. The precipitation process causes oriented reflection and scattering of the laser and small angle scattering and two-dimensional diffraction of X-rays. The chemical composition of the precipitated phase indicates it to be a metastable non-stoichiometric phase (particularly at its transparent region). The micromechanism of the precipitation phase changes in the single crystal of lead molybdate under high temperatures and is presumably envisaged to be as follows:

[Continuation of GUISUANYAN XUEBAO Vol 9 No 2, Sep 81 pp 279-284]

The collection of Mo(O) vacancies and Pb interstitial ions on {101} lattice faces is followed by their diffusion along the *a*- or *b*-axis, and reoriented to form lead-rich and lead-poor "G-P" zones and, as a result, the precipitated phases grow gradually into typical wafer-form.

AUTHOR: HE Chongfan [0149 1504 5672]
LIN Youyi [2651 0645 5030]
SU Weitang [5685 0251 1016]
LI Zhonghe [2621 0022 0735]
GU Weimin [7357 5898 3046]
RONG Xiangxian [2051 4382 0341]
et al.

ORG: HE, LIN and SU, et al., all of Shanghai Institute of Ceramics, Chinese Academy of Sciences; LI, GU and RONG all of Shanghai University of Science and Technology

TITLE: "Investigation of Growth of $PbMoO_4$ Single Crystals"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 285-294

TEXT OF ENGLISH ABSTRACT: This work investigates the relationship between growth parameters and crystal quality.

One of the distinguishing features of this investigation is the use of cross examination method in which a mathematic treatment is used to arrange the order of examination and to process the experimental data. Another feature of this investigation is the highly reproducible growth conditions of the diameter obtained

[Continuation of GUISUANYAN XUEBAO Vol 9 No 2, Sep 81 pp 285-294]

by the use of the automatically controlled buoyance balance designed by the authors. Light transmission, birefringent gradient, divergency and S/N ratio of the transmitted light beam have been used to evaluate the crystal homogeneity because of their importance from the practical point of view. Among growth parameters, the batch composition has been found to play a decisive role in crystal quality. Secondary is the pulling rate. The effects of the temperature gradient and the rotating rate prove to be rather small.

By means of petrography and electron-probe microanalysis it has been affirmed that the crystalline particles of Pb_2MoO_5 appear to scatter in the crystal when the batch composition deviates from stoichiometry to PbO-rich region. On the other hand, if the composition deviates to a MoO_3-rich region, partial supercooling of the melt takes place causing severe detriment to the crystal quality.

The authors succeeded in obtaining the optimum growth parameters for the growth of high quality single crystals, which have satisfactorily met the severe requirements of the acousto-optical deflectors and modulators.

AUTHOR: LOU Zonghan [2869 1350 3352]
XU Xianyu [1776 0341 1342]
HAN Ren [7281 7282]
LIU Chongxi [0491 1504 3356]

ORG: LOU, XU and HAN all of Zhejiang University; LIU of the Changjiang Research Institute of Hydroelectric Power

TITLE: "On the Formation and Reaction of Ettringite in Slag Cement"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 295-301

TEXT OF ENGLISH ABSTRACT: From a comparison made on the formation, morphology, transformation, stability and expandability of ettringite ($3CaO \cdot Al_2O_3 \cdot 32H_2O$) in the hydration and hardening between the gypsum slag cement and portland blast furnace slag cement, the authors have brought forward, in connection with the discussion on the mechanism of the activation of granulated blast furnace slag, a proportioning principle of preparing a non-shrinking or slightly expansive cement from portland cement clinker, slag and gypsum.

AUTHOR: WANG Yuji [3769 3768 0679]
YE Gongxin [5509 6300 2946]

ORG: WANG of Tongji University; YE of Hefei Cement Reseerch Institute

TITLE: "A Study of the Mineral Phases of Oxygen Converter Slag and Their Cementious Properties"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 302-308

TEXT OF ENGLISH ABSTRACT: Chemical composition, mineral constitution and properties of hydration of the oxygen converter slag were investigated by chemical analysis, petrographic technique, XRD, DTA and physical tests. The minerals identified are tricalcium silicate, dicalcium silicate and its phosphorus-containing solid solution, dicalcium ferrite, RO-phase, free lime and some amounts of aluminate, aluminoferrite, fluor apatite, fluorspar and metallic iron.

The quality of the slag was graded by its content of tricalcium silicate and free lime. When the steel slag has a content of tricalcium silicate >40 percent and free lime <3 percent, it can be ground with gypsum to produce qualified steel slag cement. Compressive strengths of 50~60 N/mm^2 and 30~40 N/mm^2 have been obtained from slags containing tricalcium silicate of 50~55 percent and 40~46 percent respectively.

AUTHOR: ZHANG Pixing [1728 0012 5281]
XU Wenjia [6079 3306 5521]
LU Baoshan [4151 1027 1472]
et al.

ORG: All of the Cement Division, Research Institute of Building Materials

TITLE: "Mechanism of Action of Low Alkalinity Cement on Medium-alkali Glass Fibers"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 309-317

TEXT OF ENGLISH ABSTRACT: Based on previous research and in consideration of the invariant point with the lowest CaO concentration in the system $CaO-Al_2O_3-CaSO_4-H_2O$ and $CaO-SiO_2-H_2O$, a low alkalinity cement (having a low pH value) has been made which is only slightly corrosive on the glass fibers. SEM, XRD, DTA, acidimetric analysis and chemical analysis were employed in the study on the mechanism of its action. The following conclusions have been drawn: (1) The pH value of the liquid phase compatible with the cement hydration products containing ettringite, $Al(OH)_3$ gel and gypsum is rather low; (2) the rate of attack of such cement on medium-alkali glass fibers is low, approximately that of gypsum slurry and water, and is only one-twentieth that of portland cement; (3) the durability of the medium-alkali

[Continuation of GUISUANYAN XUEBAO Vol 9 No 2, Sep 81 pp 309-317]

glass fibers immersed in the low alkalinity cement slurry is superior to that of alkali resistant glass fibers in portland cement slurry under temperatures of 50°C, and the strength of alkali resistant glass fiber remains unchanged when immersed in the low alkalinity cement slurry for a duration of seven months; (4) the attack of the cement on glass fibers is essentially for a chemical action.

AUTHOR: JIANG Wenhao [3068 2429 3185]
JIANG Dongliang [3068 2639 0081]
MAO Zhiqiong [5403 1807 8825]
et al.

ORG: All of Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Use of Perovskite $La_{1-\chi}Ca_{\chi}CrO_3$ as Electrode Material for Zirconia Solid Electrolyte"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 318-322

TEXT OF ENGLISH ABSTRACT: This paper deals with the feasibility of CaO doped lanthanum chromate $La_{1-\chi}Ca_{\chi}CrO_3$ ($x = 0$, 5 percent, 10 percent, 12 percent) as solid electrolyte to stabilize zirconia electrode. Electrical conductivity of lanthanum chromate has been studied in relation to the substitution of calcium ions for lanthanum in the crystal lattice as well as to the contraction of lattice dimensions. The compatability of $La_{1-\chi}Ca_{\chi}CrO_3$ with calcia stabilized zirconia at high temperatures has also been investigated. The thermal expansion, mechanical strength and temperature stability of $La_{1-\chi}Ca_{\chi}CrO_3$ were determined and the distribution of elements at the interface of high temperature reaction between lanthanum chromate and zirconia was investigated by electron probe microanalyzer.

AUTHOR: JIANG Zhonghong [1203 0022 1347]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Some Aspects of Regions of Glass Formation and Devitrification of Glasses"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 323-339

TEXT OF ENGLISH ABSTRACT: Based on our experiments and some data in the literature, the relation between regions of glass formation and oxide compositions of two or three component systems of borate, silicate and phosphate are discussed.

Different oxides have different characteristics of glass formation. They may be classified into six types, i.e., the glass forming body NF, the intermediate body NI, and the network modifiers which include alkali oxide NM_1, alkali earth oxide NM_2, inert electron pair metal oxide NM_3 (such as PbO, Bi_2O_3, etc.), and polyvalent oxide NM_4. Such classification makes it possible to describe the contour of the glass formation regions of various unknown ternary systems. Contrary to the traditional concept. the most stable region of glass is not in the meta-acid compounds, but in the eutectics formed near these compounds. By means of thermodynamic theory, the locations of these eutectic points and the effect of phase separation by introducing the third component can be predicted.

[Continuation of GUISUANYAN XUEBAO Vol 9 No 2, Sep 81 pp 323-339]

Some proposals for improving the devitrification characteristics of a new type of optical glasses are presented.

AUTHOR: YOU Baokun [3366 1405 0981]
CHENG Xibi [2052 1585 1732]

ORG: Both of the Cement Division, Research Institute of Building Materials

TITLE: "On the Recent Development of the Use of Gypsum in Cement Industry"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 340-347

TEXT OF ENGLISH ABSTRACT: The chemical mechanism of gypsum as a raw material in cement production is described. On this basis, cements with such characteristics as expansion, self-stressing, quick-setting, rapid-hardening and high strength are manufactured. Cements of the sulphoaluminate series, the fluorinoaluminate series, the alunite series, the sulphate-aluminate series, the sulphate series recently developed in China are being treated in detail. Certain technical requirements for the gypsum and the broad prospects of its use in the cement industry are emphasized.

AUTHOR: WANG Chengyu [3769 2110 6657]
WANG Jiafan [3769 0163 0416]

ORG: WANG Chengyu of Dalian Institute of Light Industry; WANG Jiafan of Tianjin Ninth Glass Factory

TITLE: "A Study of the Devitrification of Silica Glass Tube in the Diffusion Furnace"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 348-352

TEXT OF ENGLISH ABSTRACT: The optical microscope, scanning electron microscope, infrared absorption spectra, X-ray powder diffraction and chemical analysis have been employed in the investigation of devitrification of silica glass between 1080~1200°C. The crystalline phase identified is α-cristobalite, and the maximum rate of crystal growth is 0.375 μm per hour at 1200°C. The crystallization temperature is lower than that of high-purity silica glass as impurity in the diffusion furnace may cause the lowering of the crystallization temperature. Various factors affecting the crystallization are discussed.

AUTHOR: SHEN Jiyao [3088 4949 5069]
XU Shuntao [1776 7311 3447]
YUAN Qilong [5913 0796 3981]

ORG: SHEN of the Department of Chemical Engineering, Tianjin University; XU and YUAN both of Nanjing Research and Design Institute of Glass Fiber

TITLE: "Calculation of the Phase Compositions of AZS Materials"

SOURCE: Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 9 No 2, Sep 81 pp 353-360

TEXT OF ENGLISH ABSTRACT: In this article, a general method and set of formulas for calculating the phase compositions of AZS materials from their chemical analyses are suggested. The results show that the calculated and observed phase compositions are generally in good agreement.

9717
CSO: 4009/50

Technical Standards

AUTHOR: YAO Shiquan [1202 0013 0356]

ORG: None

TITLE: "National Radio Interference Standardization Work Group Officially Established"

SOURCE: Beijing JISHU BIAOZHUN TONGBAO [TECHNICAL STANDARDS BULLETIN] in Chinese No 5, 81 pp 11-12

ABSTRACT: Under the auspice of the National Bureau of Standards, and with the participation of the First Ministry of Machines, the Fourth Ministry of Machines, the Ministry of Post and Telecommunications, the Ministry of Light Industry, the Central Bureau of Broadcasting Industry, and the National Bureau of Metrology, the National Radio Interference Standardization Work Group was officially established on 23 Apr in Beijing, and the First Ministry of Machines and the Central Bureau of Broadcasting Industry were selected to take charge of the group. The delegates acknowledged the fact that due to lack of overall control and management, radio interference has produced serious effects on the nation and the people, to cause electromagnetic pollution to be one of the 4 common pests in some regions. Its effects on the monitoring and automation systems of communication, defense, and production departments are becoming more extensive and profound everyday. At the same time, due to strict standards of foreign countries on radio interference, machines and electrical products

[continuation of JISHU BIAOZHUN TONGBAO No 5, 81 pp 11-12]

no longer meet the requirements of international markets. The newly established work group suggests that in principle and as much as possible, the national stanards should be formulated in accordance with the recommended standards of the CISPR of IEC. The national standardization plan discussed includes the methods of testing and the maximum permissible level of radio interference property of industrial, scientific, and medical high frequency equipment, the interference resistant property test and the degree of anti-interference of audio and video receivers, and the method of testing the radio interference property and the maximum permissible level of internal combustion engines, the ignition system of motorized vehicles, etc.

AUTHOR: XU Wen [1776 5113]

ORG: None

TITLE: "National Energy Supply Bases and Management Standardization Technology Committee Established in Beijing"

SOURCE: Beijing JISHU BIAOZHUN TONGBAO [TECHNICAL STANDARDS BULLETIN] in Chinese No 5, 81 p 12

ABSTRACT: A meeting was called in Beijing on 16-17 May 81 for the establishment of the National Energy Sources and Management Standardization Technology Committee. It was chaired by DAI Hesheng [2071 5440 3932] of the Comprehensive Research Institute of Standardization of the National Bureau of Standards. The newly established committee is composed of 28 members, with China's famous engineering thermophysicist WU Zhonghua [0702 0112 5478] as the chairman. The major responsibility of the committee is to study and propose policies of China's energy source bases and management standardization, to organize the formulation of national energy sources bases and management standards, and to carry out revision, review, propaganda, and implementation work. Following considerable discussion, a brief rule of work of the committee and the work plan of 1981-82 were agreed upon. The delegates listened and discussed the national standards of heat energy units, symbols, and conversions, the heat equipment energy equilibrium principle, the equipment thermal efficiency calculation principle, and the comprehensive energy consumption calculation principle. Finally, it was resolved that a second meeting of the entire committee will be held in Shanghai during the Spring Festival time.

AUTHOR: SHI Baoquan [4258 0202 5425]
FAN Chenyi [5400 2110 0034]

ORG: Both of Mechanical Equipment Division, National Bureau of Standards

TITLE: "An Expanded Membership Meeting of the National Vacuum Technology Standardization Technology Committee Held in Huangshan"

SOURCE: Beijing JISHU BIAOZHUN TONGBAO [TECHNICAL STANDARDS BULLETIN] in Chinese No 5, 81 p 13

ABSTRACT: The expanded membership meeting of the National Vacuum Technology Standardization Committee was held in Huangshan of Anhui on 7-12 May 81, being the second meeting since last year's conference to establish the committee. The document, Terms and Terminology of Vacuum Technology, drafted by Shenyang Research Institute of Vacuum Technology was reviewed. Vacuum technology is new in China but it has developed into a complete field and applied in petroleum, chemical engineering, metallurgy, electronics, defense, etc, but there are yet no related national standards. The national standard of terms and terminology is a much needed first step toward standardization of vacuum technology. Based upon the opinions suggested by the delegates at the meeting, the Shenyang Research Institute will reorder the draft and mail it to related units and specialists to solicit suggestions and to prepare for its approval by the 1981 Annual Conference of the Technology Committee.

6168
CSO: 4009/87

AUTHOR: TAO Zhenyu [7118 2182 1342]

ORG: None

TITLE: "On the Problem of Rock Mechanics in Current Development of Hydroelectricity in China"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 9, 81 pp 1-4

ABSTRACT: Hydroelectricity occupies an extremely important part in China's development and utilization of energy resources, yet in order to accelerate its development, many key problems of science and technology are in need of resolving and one of these is the problem of rock mechanics. According to the most recent statistics, China's hydroelectrical reserve, distributed mostly to the west of the Beijing-Guangzhou line, is 68,000Mw and only about 2.36 percent has been developed to date. About 60 percent of this reserve is concentrated in the 3 provinces of Xizang, Sichuan, and Yunnan, where only 0.4 percent of it has been developed. Geographically speaking, therefore, the key region of future hydroelectrical development is where China's high intensity seismic region is. The complex geological and geomorphological conditions of the region will necessitate greatly increased underground engineering and from the view point of rock mechanics, the problems will involve the initial stress of rocks, the influences of ground temperature, characteristics of the seismic rock medium, and the stability of rocky slopes. New breakthroughs are obviously needed to obtain satisfactory resolutions to these problems.

AUTHOR: ZHU Keshan [2612 0668 6365]
XU Sishu [1776 1835 3219]

ORG: None

TITLE: "Applications of Underground Caverns in Chongqing"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 9, 81 pp 17-22

ABSTRACT: Chongqing is located at the point of convergence of the 2 rivers of Jialing and Changjiang. Within the urban area, the terrain is highly undulated while the division by the 2 rivers further aggravates the problem of lack of space. From the point of view of city planning and according to domestic and foreign experiences, there are 2 possible solutions; to build either high-rises or underground structures. Judging from material requirements, energy consumption, and construction cost, underground development is the more promising of the two. For this reason, Chongqing has had more than 40 years of history of underground construction. For the purpose of saving above ground space, underground structures of the Sichuan Provincial Ship Repair Plant, the lounge of the public transportation station No 1, the Chongqing Municipal Watch and Clock Company, etc. have been built and in use for years. There are also the Dabanqiao Underground Meat Cold Storage, the fruit and vegetable warehouses, and the underground granary for utilizing the thermal stability and airtightness of underground caverns. The 51 Movie Theater and the Chongqing Tobacco Plant have underground tunnel ventilation. These structures are described. Numerous photos of these structures are included.

AUTHOR: None

ORG: Zhenjiang Municipal Civil Defense Office; Zhenjiang Municipal Bureau of Grains

TITLE: "A Survey of the Condition of Grain Stored in Guanping Underground Granary of Zhenjiang City"

SOURCE: Chongqing DIXIA GONGCHENG [UNDERGROUND ENGINEERING] in Chinese No 9, 81 pp 22-23

ABSTRACT: Based upon the needs of war preparation, the Zhenjiang Bureau of Grains began to build the Guanping Underground Granary in the southern suburb of the city in 1973. It was completed 3 years later. It has an area of 1343 m^2 and a capacity of storing 2.60 million jin of grain. Since its completion, 8 types of foods, including grain, processed food, edible oil, potatoes, etc. totaling 5.03 million jin of foods have been alternately stored. The nutritional quality and the condition of change of the 10 thousand jin of Xian rice and 1.17 million jin of wheat have been compared with identical types stored in surface warehouses. Major advantages of the underground storage are found to be low temperature, dryness, airtightness, and low cost. Multiplication of pests and microorganisms is found to be under control and quality deterioration of the grains is found to be delayed. Details of these and other findings of the survey and comparative testing are discussed.

6168
CSO: 4009/81 END

JPRS 79475

19 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 137

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79475

19 November 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 137

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Ninth Artificial Satellite Successfully Launched (Jiang Bin; BEIJING WANBAO, 23 Sep 81) 1

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Announcement of Meeting of Chinese and American Geophysicists (SHIYOU DIQIUWULI KANTAN, No 4, 1981) 3

Society of Petroleum Geophysicists Introduced (SHIYOU DIQIUWULI KANTAN, No 4, 1981) 4

ABSTRACTS

ENGINEERING

TONGJI DAXUE XUEBAO /JOURNAL OF TUNG-CHI UNIVERSITY/, No 3, 1981.... 5

ENGINEERING THERMOPHYSICS

GONGCHENG REWULI XUEBAO /JOURNAL OF ENGINEERING THERMOPHYSICS/, No 3, Aug 81 14

MECHANICS

GUTI LIXUE XUEBAO /ACTA MECHANICA SOLIDA SINICA/, No 3, Aug 81....... 26

MINING AND METALLURGY

ZHONGNAN KUANGYE XUEYUAN XUEBAO /JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY/, No 2, Jun 81.......................... 33

SHIPBUILDING

SHANGHAI JIAOTONG DAXUE XUEBAO /JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY/, No 2, May 81....................................... 46

NINTH ARTIFICIAL SATELLITE SUCESSFULLY LAUNCHED

Beijing BEIJING WANBAO in Chinese 23 Sep 81 p 2

[Article by Jiang Bin [3068 2430] of the Chinese Institute of Space Technology: "China's Ninth Artificial Satellite"]

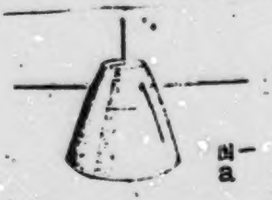
[Text] It was early morning on 20 September. A huge carrier rocket slowly rose over China, dragging a long flame at its tail. It first ascended vertically and then made a gradual turn and quickly disappeared into the sky. This marked the successful launching of China's ninth artificial satellite. It was named "Scientific Experiment Satellite No 9" or "SWK-9" for short.

Scientific Experiment Satellite No 9 consists of a collection of three satellites. A single carrier satellite was employed in this launch and three satellites were delivered into orbit simultaneously. This space technology is known as the "single-rocket multiple-satellite technique."

The orbits of the three satellites are approximately the same: the perigee is at 240 kilometers, the apogee is at 1610 kilometer, the angle between the orbit plane and the earth equatorial plane is 59.5 degrees and they revolve around the earth every 103 minutes.

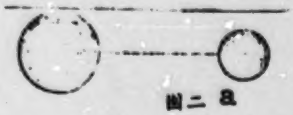
Each satellite has its unique shape. The heaviest of the three has the shape of a truncated cone, (see Figure 1) and consists of two trucated cones joined together with the appearance of a suspended bell. Rod-shaped resonator antennas extend from the top surface and the side wall of the upper truncated cone. Once in orbit, the satellite continuously emits radiowaves at 40 MHz and 160 MHz. The lightest of the three satellites is spherical in shape and consists of a metal sphere and a balloonconnected by a thin wire, as shown in Figure 2.

a--Figure 1



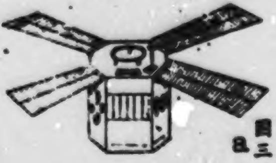
图一 a

a--Figure 2



图二 a

The third satellite is the main body of the Scientific Experiment Satellite No 9 and is shaped like an octagon, 1.1 meters high, and the diameter of the exterior is 1.2 meters, see Figure 3.



a--Figure 3

Four rectangular solar cell panels are symmetrically attached on the edges of the octagon. These panels convent the received solar energy into electrical energy and supply power to various electronic equipment on board.

The principal mission of SKW-9 is high altitude physical exploration. The satellite is equipped with more than 10 detecting devices: some measure the atmospheric density at the satellite location, some detect infrared and ultraviolet radiation emitted from the earth-atmosphere system, some measure the quantity and energy of high altitude protons and electrons and still others specifically detect the x-ray and ultraviolet radiation of the sun. Data obtained in this exploration will serve as background data on space environment in the development of China's space technology and will also provide preliminary conditions for China's space physics research.

Once the satellite enters its flight orbit, the radio remote control system goes to work. Using a 480 MHz carrier, signals containing high altitude physical data and satellite flight engineering data such as satellite attitude in orbit and interior temperature of the satellite are constantly transmitted. These parameters are used to modulate the 480 MHz radio carrier wave. Once these signals are received on the ground, a smoothing process quickly reveals the variation of the physical quantities on the satellite. This technique is known as "real-time remote sensing".

Since the radiowaves propagate along a straight line, we can no longer receive them once the satellite has moved away from the sky above China. To counter this, the satellite is equipped with a "memory device" which records the signals as they occur and then, when the satellite is over China again, transmits the signals via a 180 MHz carrier. The data received by the ground station were actually measured by the satellite some time earlier; hence, the technique is known as "delay-time remote sensing". Scientific Experiment Satellite No 9 has both real-time and delay-time remote sensing capabilities, which allows us to obtain data measured over the entire globe.

9698
CSO: 4008/11

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ANNOUNCEMENT OF MEETING OF CHINESE AND AMERICAN GEOPHYSICISTS

Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 4, 1981 p 36

[Article: "Joint Academic Meeting of Chinese and American Geophysicists Will Be Held in Beijing"]

[Text] A joint academic meeting sponsored by geophysicists of both China and the United States will be held in Beijing in September, 1981. The main subject to be discussed is geophysical prospecting for oil and gas, including
--ease histories,
--methods and ideas for solving difficult geophysical problems,
--geophysical theories and philosophies,
--studying the structure of sedimentary basins by using geophysical data,
--seismic stratigraphic studies and their related special processing of data, and
--developments and applications of new methods and new techniques.

Forty representatives from each side will be present and 35-40 papers will be read at the meeting by each group. The meeting is scheduled to last five days. During the meeting, the American representatives will be invited to visit the Data Processing Center of the Geophysical Research Institute of China National Oil and Gas Exploration and Development Corporation and the geophysical exploration exhibition sponsored by the Society of Petroleum Geophysicists.

9717
CSO: 4020/2

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

SOCIETY OF PETROLEUM GEOPHYSICISTS INTRODUCED

Baoding SHIYOU DIQIUWULI KANTAN [OIL GEOPHYSICAL PROSPECTING] in Chinese No 4, 1981 p 94

[Article: "Brief Introduction to the Society of Petroleum Geophysicists"]

[Text] The Society of Petroleum Geophysicists (SPG) is established for the purpose of raising the level of its members' technological knowledge and of developing the petroleum geophysical industry of China.

In the council of the society there are honorary presidents, president, vice-presidents, secretary-general, vice secretaries-general and directors. They, except for the honorary presidents, form a standing committee to exercise the authority of the council.

The society will hold a relatively large anniversary meeting and some forums on techniques each year. It will also offer some training courses and conduct some academic activities.

SPG publishes a bimonthly journal called OIL GEOPHYSICAL PROSPECTING which reports new techniques and new ideas on petroleum geophysics. SPG has a department of materials and literatures.

The leading members of the council are:

GU Gongxu [7357 0501 0650]	honorary president, geophysicist
FU Chengyi [0265 2110 5030]	honorary president, geophysicist
WENG Wenbo [5040 2429 3134]	honorary president, geophysicist
LIN Yungen [2621 6663 2704]	president, geophysicist
PAN Yuan [3382 3850]	vice-president, geophysicist
LU Banggan [7120 6721 1626]	vice-president, geophysicist
ZHU Dashou [2612 1129 2219]	vice-president, geophysicist
CHU Shaoliang [0328 4801 5328]	vice-president, geophysicist
YU Xisheng [0060 6932 0524]	secretary-general, geophysicist
YU Zhanyuan [0060 0594 0337]	vice secretary-general, geophysicist
WANG Jingyu [3769 2529 3558]	vice secretary-general, geophysicist
CHEN Junsheng [7115 0193 3932]	editor-in-chief, director of the department of material and literature, geophysicist

Address of the council: P.O. Box 11-1, Zhuoxian, Hebei, PRC

9717
CSO: 4020/2

Engineering

AUTHOR: JIANG Mingqian [5592 2494 6197]
LI Sen [2621 2773]
ZHANG Jiancheng [1728 1696 2052]
LIU Jinhui [0491 6930 1979]

ORG: JIANG of the Institute of Chemistry, Chinese Academy of Sciences, Beijing; LI of Tongji University; ZHANG and LIU both of the Institute of Photochemistry and Photographic Science, Chinese Academy of Sciences, Beijing

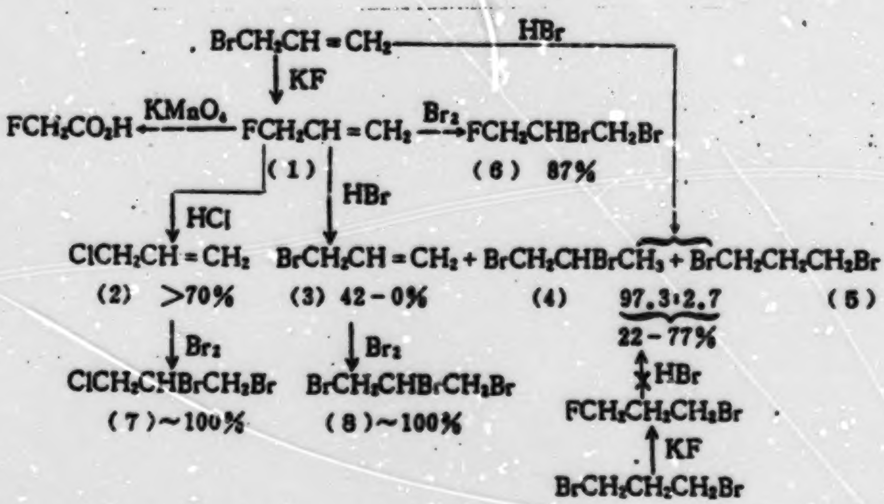
TITLE: "The Activity of the Fluorine Atom in 3-Fluoropropylene. I. The Halogenation Reaction of 3-Fluoropropylene"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: The substitution of halogen atom in halo-hydrocarbon by its lighter colleague is a normal process and is utilized extensively for the preparative purpose. Alternatively, the reverse processes, i.e., the heavier colleagues substitute for the lighter ones, take place more difficultly and hence are rather rare. Until now, fluoro-benzene has been the only fluoro-hydrocarbon known that can be substituted for by chlorine or bromine. We believe that such a reverse substitution process depends not only on the kind of halogen atom, but also on the molecular structure to which the halogen atom is attached. If one could design a molecular structure of halo-hydrocarbon in which the halogen atom was

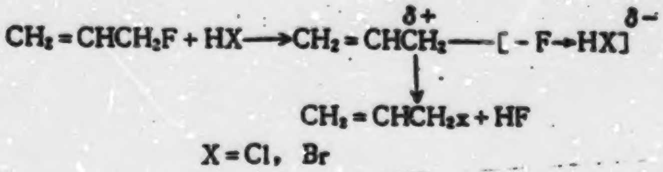
[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 1-6]

active enough, the reverse substitution reaction would proceed smoothly. This is the case. It is indeed found that the reaction between allyl fluoride and hydrogen halide (here the halogen = chlorine or bromine), under the typical ionic addition-reaction condition, is the substitution of fluorine by chlorine or bromine rather than the addition of hydrogen halide to the ethylenic double bond, due to the activity of the fluorine atom attached to the allylic position. The results are summarized in the following scheme:


$BrCH_2CH=CH_2$
HBr
KF
FCH_2CO_2H
$KMnO_4$
$FCH_2CH=CH_2$
(1)
Br_2
$FCH_2CHBrCH_2Br$
(6) 87%
HCl
HBr
$ClCH_2CH=CH_2$
(2) >70%
$BrCH_2CH=CH_2$
(3) 42-0%
$BrCH_2CHBrCH_3$
(4)
$BrCH_2CH_2CH_2Br$
(5)
97.3:2.7
22-77%
Br_2
$ClCH_2CHBrCH_2Br$
(7)~100%
Br_2
$BrCH_2CHBrCH_2Br$
(8)~100%
HBr
$FCH_2CH_2CH_2Br$
KF
$BrCH_2CH_2CH_2Br$

[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 1-6]

A substitution-reaction mechanism including a n-complex intermediate, as shown below, has been tentatively suggested:



$$CH_2=CHCH_2F+HX\longrightarrow CH_2=CH\overset{\delta+}{CH_2}\!-\![-F\rightarrow HX]^{\delta-}$$

$$\downarrow$$

$$CH_2=CHCH_2x+HF$$

$X=Cl,\ Br$

AUTHOR: YAN Deyue [7346 1795 1471]

ORG: Tongji University

TITLE: "Progress in the Theoretical Study of Configurational Sequence of Vinyl Polymers. I. Atactic Polymerization and Bernoullian Process"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 7-15

TEXT OF ENGLISH ABSTRACT: The statistical theory of stereo-configurational sequence distribution of vinyl polymers is reviewed comprehensively. Various Markovian probabilities of mult-ads are singled out. A lot of relationships among the frequencies of occurrence of n-ads with different configurations, based on analysis of the probabilities listed already, are obtained. The results derived from statistics are checked by means of non-steady state kinetics. The first part of this series, i.e., the present paper, deals with the atactic polymerization and Bernoullian process. A set of decision equations for the Bernoullian trial model is derived. With the aid of these decision equations, Bovey's plot is simplified into a straight line. It is found that, for the Bernoullian process, the points resulting from the experimental data of NMR conform with the standard line within the experimental error in the decision plots; on the other hand, when these points deviate from the standard line outside the experimental error, the relative polymerization must be a Markovian process. For instance, the predominant syndiotactic

[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 7-15]

PMMA is generated by radical polymerization or anionic polymerization in polar solvents, of which the stereo-specificity follows the Bernoullian trial model; alternatively, the predominant isotactic PMMA, which fits in with the Markovian trial model, is produced with anionic polymerization in non-polar solvents, or in polar solvents using C_s^+ as the counter ion, or with radical polymerization in solid state. In the next paper, the Markovian processes will be discussed.

AUTHOR: SHI Meilun [0670 5019 0243]

ORG: Tongji University

TITLE: "Electrochemistry on Fermi Surfaces. I. Qualitative Features"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 16-23

TEXT OF ENGLISH ABSTRACT: The concept of the Fermi Surface in momentum space, which is directly derived from quantum statistical mechanics as it is used in metal physics and which is now in wide use far beyond the scope of solid state physics, is now considered to be of fundamental importance in elucidating the quantum statistical nature of electrode potential in electrochemistry. Based on the concept of the Fermi Surface, the nature of the electrode potential and hence the redox potential has been associated with the parameter μ in Fermi-Dirac statistics, the potential of zero charge has been related to the radius of the naked Fermi sphere in the solid phase, and the double layer capacitance may be evaluated by the concentration of electrons beyond the Fermi surface. The exchange current and the electrode kinetics have also been discussed. The difference between the ideal polarized electrode and the ideal non-polarized electrode has been associated with the possibility of potential modulation of the electrode to change the radius of Fermi sphere.

[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 16-23]

All the electrochemical processes, including corrosion and passivation, can be clearly understood in terms of Fermi surfaces. An electrochemical cell may be regarded as two Fermi spheres which are in contact with each other. In case of nonequilibrium, electrons flow from one of the two Fermi spheres to the other, and consequently fall through one of the Fermi surfaces into the Fermi sea, and simultaneously the same amount of electrons will escape from the other Fermi sphere and compensate for the loss of the electrons in the former process. The former process is called the cathodic process while the latter is called the anodic process. Thus the cathodic and anodic currents originate from the redistribution of electron states near the Fermi surfaces.

Tafel's equation has been obtained by evaluating electron populations beyond the Fermi sphere.

AUTHOR: LING Yongyong [5677 6978 6978]

ORG: Tongji University

TITLE: "On the Generalization of C.N. Yang's Equation--The Generalized Gravitational Gauge Field Equations"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 24-32

TEXT OF ENGLISH ABSTRACT: The asymptotic solutions with spherical symmetry, static metric to the generalized C.N. Yang's equation $R_{ik;l} + \Lambda R_{il;k} = 0$ have been obtained. Our approximate solution for $\Lambda \neq -1$, $\Lambda \neq -2$ simultaneously is the Schwarzschild solution, that for $\Lambda = -2$ is similar to the Reissner-Nordström metric, and that for $\Lambda = -1$ is the solution of C.N. Yang's gravitational gauge field. Namely

$$ds^2 = -\left[1 - \frac{a}{r} + 0\left(\frac{1}{r}\right)\right]dt^2 + \frac{dr^2}{1 - \frac{a}{r} + 0\left(\frac{1}{r}\right)} + r^2(d\theta^2 + \sin^2\theta\, d\varphi^2), \Lambda \neq -1, \Lambda \neq -2$$

$$\left.\begin{aligned} ds^2 &= -\left(1 - \frac{a}{r}\right)dt^2 + \frac{dr^2}{1 - \frac{a}{r} + \frac{a^2}{8r^2}} + r^2(d\theta^2 + \sin^2\theta d\varphi^2) \\ ds^2 &= -\left(1 - \frac{a}{r} + \frac{a^2}{8r^2}\right)dt^2 + \frac{dr^2}{1 - \frac{a}{r}} + r^2(d\theta^2 + \sin^2\theta d\varphi^2) \\ ds^2 &= -\left(1 - \frac{a}{r} + \frac{a^2}{8r^2}\right)dt^2 + \frac{dr^2}{1 - \frac{a}{r} + \frac{a^2}{4r^2}} + r^2(d\theta^2 + \sin^2\theta d\varphi^2) \end{aligned}\right\} \Lambda = -2$$

[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 24-32]

$$ds^2 = -\left[1 - \frac{b}{r} + 0\left(\frac{1}{r}\right)\right] dt^2 + \frac{dr^2}{1 - \frac{a}{r} + 0\left(\frac{1}{r}\right)} + r^2(d\theta^2 + \sin^2\theta d\varphi^2), \ \Lambda = -1.$$

Three pairs of equivalence conditions for the generalized C.N. Yang's equation and for the divergence equations of the energy-momentum tensor are derived by using Einstein's gravitational field equation. For the special case of $\Lambda = -1$, our theorem coincides with one of those in C.N. Yang and Gu Chaohao's theory of the gravitational gauge field.

AUTHOR: JIN Ruichun [6855 3843 2797]
LIU Yongren [0491 3057 0088]
CHEN Xuechao [7115 1331 3390]

ORG: All of Tongji University

TITLE: "On the General Purpose Wavefront Method"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 33-43

TEXT OF ENGLISH ABSTRACT: When the wavefront method is used to solve some large structures, a difficulty will arise if the stiffness matrices of the wavefront are too large to be entirely stored in the main memory. The difficulty can be overcome by using the general purpose wavefront method, a new variety of the well-known wavefront method. When this method is used, a part of the stiffness matrices of the wavefront may be stored in the file memory so that there is no limit to the size of the stiffness matrices of the wavefront, and some particular techniques are used to manage the operations and the input-output. These techniques, stated in paragraphs §2-§7 of this paper, include the organization of locations, the assemblage process of the element matrices to the structure matrices, the generation of the unit pivot lows, the reduction of the stiffness matrices of the wavefront, the elimination and management of wavefront variables. The flowcharts of

[Continuation of TONGJI DAXUE XUEBAO No 3, 1981 pp 33-43]

the main operations for this method are given. The time spent on input-output is evaluated. Finally, the results of a practical example are given and compared with those of other methods and experiments.

AUTHOR: YAO Zukang [1202 4371 1660]

ORG: Tongji University

TITLE: "Thermal Warping Stresses in Concrete Pavements"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 44-54

TEXT OF ENGLISH ABSTRACT: The thermal warping stresses in concrete pavements resting on semi-infinite continuum were analyzed by the finite element method and, as a result, the curves of warping stress coefficients against relative length (or width) were plotted.

The noncontact phenomena of slabs with Winkler foundation and semi-infinite continuum while warping and the warping stress changes as the influences of noncontact being considered were also analyzed. It was found that the area of noncontact and its gap would become greater as the slab shortened, the temperature gradient increased and the relative stiffness of the slab decreased, but they would be much smaller when the wheel load acted. The noncontact phenomenon of slab with Winkler foundation was more severe than that with semi-infinite continuum. The warping stress would be lower when the negative (downward) reaction of the foundation was discarded. It was clear that the warping stresses of shorter slabs (≤6m) are overestimated by Westergaard's theory as the influence of noncontact is not considered.

AUTHOR: ZHENG Guoquan [6774 0948 2938]

ORG: Tongji University

TITLE: "A Primary Suggestion for Using the 'Cord Offsetting' Instead of 'Tangent Offsetting' to Determine the Coordinates of the Perspective Views of a Freeway"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 55-67

TEXT OF ENGLISH ABSTRACT: In using the cord offsetting method, which includes the corrections of angles of radial cross sections and cross sections themselves, to determine the coordinates of the perspective views of a freeway, the protractor would no longer be needed. Therefore the drawing would be simplified and the coordinates of perspective views are more accurate.

When the formulas are programmed and the relevant data are fed into a computer, the corresponding points of perspective views will be obtained right away. On this basis, the whole perspective figure of the freeway will be drawn by the computer automatically.

The selection and plan of drawing sheets are also contained.

AUTHOR: YANG Peikun [2799 0160 2492]

ORG: Tongji University

TITLE: "An Analytical Method Based on Conflicts for Vehicular Capacity at Signalized Intersections"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 68-76

TEXT OF ENGLISH ABSTRACT: This paper presents a new analytical approach as a guide for calculating vehicular capacity at signalized intersections. The differences between this new method and the other methods employed at home and abroad are as follows: (1) the capacity calculated by this method is the capacity of vehicles passing through the conflicts at an intersection instead of the capacity of vehicles passing through the stop lines, and (2) the left-turn volumes are computed directly instead of using the equivalent factor. The movement state of the traffic through the conflicts at an intersection is described. The method of calculation and the formulae are provided with a typical example. All of the formulae have been reviewed practically.

AUTHOR: HU Yuren [5170 7183 0086]

ORG: Tongji University

TITLE: "Design of the Vibration Pick-up Model GCS-1 for Engineering Survey"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 77-88

TEXT OF ENGLISH ABSTRACT: In this paper, by using the method of transfer function analysis, an intact theoretical basis of vibrating displacement pick-up of pendulum type has been analyzed. The response of the pendulum system is also studied. A new type of element, a circular-tube shaped spring, has been adopted, thus simplifying the equipment structure and reducing the installed elements. In addition, a differential negative feedback circuit with compensative links is used, obviously improving the amplitude-phase characteristic of the system.

AUTHOR: SHEN Hongfu [3088 1347 3940]
ZHONG Weiling [6945 0251 7792]
WANG Jiazheng [3769 0502 2398]
WANG Hongxing [3769 3163 5281]

ORG: All of Tongji University

TITLE: "Development of a Differential Capacitance Accelerometer"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 89-97

TEXT OF ENGLISH ABSTRACT: The differential capacitance accelerometer has the following advantages: it can be used for measuring the acceleration of zero Hz; it can work under severe circumstances; it is small and light; its sensitivity is high and its follow-up apparatus required are simple. All these advantages make it a quite new accelerometer that has wide applications.

In this paper we have analyzed and discussed in detail its principles and the cause of its operation errors in order to offer a theoretical basis for developing this accelerometer. In addition, the practical functions of the developed accelerometer, Model CYJ-1, are also described.

AUTHOR: YANG Xizhang [2799 3356 4545]
WEI Daoduo [7614 6670 1000]

ORG: Both of Tongji University

TITLE: "Development of an Automatized Measuring Apparatus for the At-rest Earth Pressure Coefficient"

SOURCE: Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 98-103

TEXT OF ENGLISH ABSTRACT: The coefficient of at-rest earth pressure Ko is an important parameter in studies of deformation and strength properties of soils. In this paper, the development of a new Ko-meter as an innovation of the presently available laboratory apparatus by providing an automatized measuring and recording system is presented. Preliminary tests show that the instrument is simple in construction, easy to operate and the results are reliable. The automatized system may also be used with the triaxial apparatus. It is suggested that the new Ko-meter presented can be adopted for routine laboratory tests.

AUTHOR: LI Congxian [2621 1783 0341]
MIN Qiubao [7036 44231405]

ORG: Both of Tongji University

TITLE: "The Time of Holocene Transgression and Sea Level Changes in Apical Area of the Changjiang Delta"

SOURCEL Shanghai TONGJI DAXUE XUEBAO [JOURNAL OF TUNG-CHI UNIVERSITY] in Chinese No 3, 1981 pp 104-108

TEXT OF ENGLISH ABSTRACT: Based upon a investigation of the boring core in Zhenjiang, the apical area in the Changjiang Delta, the Holocene transgression is dated between 9000 and 6300 years BP, when sea level was located at 10-12 m and 2-3 m below the present Wusong level respectively. Since 6300 years BP in the area the Zhenjiang, boring deposited sediments of freshwater marsh, so it seems that in the Changjiang Delta area sea level was no higher than that at present during 5000-6000 years BP.

9717
CSO: 4009/58

Engineering Thermophysics

AUTHOR: YANG Donghua [2799 2639 5478]

ORG: East China Institute of Chemical Technology

TITLE: "Unified Expressions of Exergy and Anergy of Substance Systems"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 203-204

TEXT OF ENGLISH ABSTRACT: In this paper, unified expressions of exergy and anergy for three different kinds of substance systems, i.e., the closed system, the steady flow and the open system with steady flow, are given. According to given equations obtained from unified expressions, the product pv, based on its physical significance, can be considered as the work which is supplied from the upstream of a steady flow to downstream or an open system. The zero-exergy ex_0, which characterizes difference of composition between the steady flow and surrounding medium, is also involved. Accordingly, the unified expressions thus obtained are the most reasonable and generalized ones up to the present.

AUTHOR: LIU Dongbo [0491 2639 0514]

ORG: Huaibei Coal Teacher's College

TITLE: "An Investigation of the Thermodynamics of Irreversible Processes of Isothermal Elasto-plastic Metal"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 205-210

TEXT OF ENGLISH ABSTRACT: In view of the non-existence of mechanical state function for plasticity, it is attempted in this paper to investigate the thermodynamics of plasticity in terms of dislocational thermodynamic functions, such as:

$U = U(s.V.m.n)$..............internal energy

$s = s(T.V.m.n)$..............entropy

$F = (U - Ts) = F(T.V.m.n)$....free energy (Hemholtz)

$m + nn_0 = \text{constant}$;

m, n and n_0--number of atoms in good region, of dislocations and of atoms per dislocation;

V--plastically incompressible volume of the metal. The results obtained are:

(1) dF_T is expressed in terms of entropy production ($d_i s > 0$) and in terms of dissipation ($\delta>0$, $\Delta>0$),

$dF_T = -\delta A - T d_i s = (-\delta A - \delta) < 0$........unloading

$dF_T = +\delta A - T d_i s = (+\delta A - \delta) > 0$........loading

[Continuation of GONGCHENG REWULI XUEBAO No 3, Aug 81 pp 205-210]

with:

$$\delta = Td_{i}s; \quad \Delta = \Delta_{i}s;$$

δA -- work of deformation.

(2) For thermodynamical stress-strain cycle (Th):

$$\oint_{Th} dF_T - \left[\oint_{Th} (\pm \delta A) - \Delta_{Th}\right] = 0;$$

(3) For non-thermodynamical stress-strain cycle (M):

$$\oint_{M} dF_T \neq 0 \cdots\cdots\cdots \text{non-thermodynamical cycle;}$$

$$\oint_{M} dF_T \nless 0 \cdots\cdots\cdots \text{perpetual free-energy-machine does not exist.}$$

therefore:

$$\oint_{M} dF_T - \left[\oint_{M} (\pm \delta A) - \Delta_{M}\right] > 0$$

Δ_M——total dissipation in the cycle.

(4) No matter whether the stress-strain cycle is thermodynamical or not, the cyclic work is always plastic and positive, and the absolute value of work is always greater in loading than in unloading. The only difference is that the plastic work is dissipated completely or partially.

[Continuation of GONGCHENG REWULI XUEBAO No 3, Aug 81 pp 205-210]

Inasmuch as the state function of elasticity cannot be extended to plasticity and the state function of this paper reflects the dislocational nature of plastic processes of metal, perhaps the theory of this paper may afford a thermodynamic foundation for plasticity.

AUTHOR: JU Zixiang [1446 3320 6272]
CHEN Yuanli [7115 0337 0448]
LIANG Cuifang [2733 5050 5364]
et al.

ORG: All of the Institute of Electrical Engineering, Chinese Academy of Sciences

TITLE: "Composition, Thermodynamic and Electrical Physical Properties of Seeded Coal Combustion Product"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 211-213

TEXT OF ENGLISH ABSTRACT: This paper describes briefly a method for calculating chemical composition in equilibrium, thermodynamic and electrical properties of seeded coal combustion plasma. Under conditions interested in MHD generation, 61 components in liquid and gas phase, 20 thermodynamic and 3 electrical properties are calculated respectively.

AUTHOR: WU Wen [0702 2429]

ORG: Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences

TITLE: "Technology of Utilization of Industrial Waste Heat"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 214-219

TEXT OF ENGLISH ABSTRACT: To utilize the industrial waste heat (IWH) is an effective way of promoting the total utilization of fuels. This paper first analyzes the forms and characteristics of IWH, then estimates its quantities and amounts of which can be utilized. After discussing three ways of utilization, i.e., electrical power generation, thermal utilization and their combination, various technical problems evolved are discussed in detail. These technical problems are new equipment, new technology and new processes. Finally, a recommendation is given that a financial appraisal be made to insure the benefit of adding and alternating of installations.

AUTHOR: LU Canren [0712 3605 0088]

ORG: Energy Sources Laboratory, Tianjin University

TITLE: "Thermodynamics Analyses of Binary Fluid Cycle with Low Enthalpy Energy Sources"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 220-223

TEXT OF ENGLISH ABSTRACT: This paper discusses the effects on energy conversion of binary fluid cycle with low temperature geothermal energy by means of availability function analysis of thermodynamics. An example is provided to show practice.

AUTHOR: None

ORG: Inlet Distortion Research Group, Northwestern Polytechnical University

TITLE: "An Investigation of the Characteristic and Instability Behavior of an Axial Compressor in a Turbojet Engine"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 224-229

TEXT OF ENGLISH ABSTRACT: In this paper, experimental results and analysis of the effect of the inlet pressure distortion, decrease in the first stage turbine nozzle area and engine test run program on the characteristic and instability behavior of an axial compressor in a turbojet engine are presented. The experiments have been conducted on the test bed of a turbojet engine with a nine-stage compressor, whose first stage is transonic.

The results show that: (1) inlet distortion and decrease in turbine nozzle area may shift considerably the speed lines of the compressor toward the left and cause it to become more flat; (2) the different run program for engine test may produce different speed line of compressor both in position and shape; (3) at low and medium speed, the instability of the compressor exhibits itself as a rotating stall, and at high speed a surge whose mode depends on the degree of inlet distortion and decrease in turbine nozzle area.

AUTHOR: LIU Zhiwei [0491 1807 0251]

ORG: Northwestern Polytechnical University

TITLE: "Prediction of Onset of Rotating Stall Using Small Perturbation Theory for Axial Flow Compressors"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 230-236

TEXT OF ENGLISH ABSTRACT: This paper analyzes, generalizes and compares different onset conditions of the predicting rotating stall, which are based on the small perturbation theory. They are correlated to experimental data of rotors for single stage axial flow compressors. Good agreement between theoretical values and experimental values is found. Mechanism for the onset condition of the rotating stall is analyzed. Effectiveness of methods of prediction is proved. The extent of application of methods is extended.

AUTHOR: ZHANG Yujing [1728 3768 3878]

ORG: Harbin Marine Boiler and Turbine Research Institute

TITLE: "Some Considerations Concerning the Principal Equation for the Aerodynamic Calculation of Non-radial Calculation Station on S_2 Stream-surface Flow in Turbomachines"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 237-242

TEXT OF ENGLISH ABSTRACT: Based on Wu's equations expressed in terms of nonorthogonal curvilinear coordinates, this paper derives a y-direction equation of motion for the aerodynamic calculation of the non-radial calculation station on the S_2 stream-surface flow in a turbomachine blade passage. Thereby it is proved that the equation applied by Hetherington (1974) is correct. By means of transformation, it is pointed out that the principal equation of this paper is in full agreement with that presented by Hong previously.

AUTHOR: GAO Lijun [7559 7787 0669]
WU Wendong [0702 2429 2639]
WANG Yingshi [3769 2019 2514]

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Numerical Calculation of a Subsonic Compressible Turbulent Flow in a Conical Diffuser"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 243-249

TEXT OF ENGLISH ABSTRACT: In this paper, vorticity ω and stream function Ψ are used as dependent variables to predict the turbulent flow. Generally, the method can be used to calculate both recirculating flow and non-recirculating flow. The calculation of the turbulent flow in a conical diffuser having a total divergence angle of 10°, and with nonuniform velocity distribution at entry, is carried out. Because the flow relates only to the developing process of turbulence boundary layer, Prandte mixing length hypothesis is used in this calculation.

The numerical results agree with the experimental data quite well. They show that this method can be applied to the design of a diffuser without recirculating flow.

AUTHOR: WANG Jiasheng [3769 3946 0581]

ORG: Shanghai Institute of Mechanical Engineering

TITLE: "The Analysis of Forces and Powers in Turbomachinery Gas Dynamics"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 250-252

TEXT OF ENGLISH ABSTRACT: Correctly analyzing the forces and powers is a very important problem in turbomachinery gas dynamics. This problem is discussed in detail in this paper, and it is concluded that the realization of forces and powers is concerned with the situation of observers. When we discuss the forces, we must point out the situation of observers; when we discuss the powers, we must point out what force to work in what motion.

AUTHOR: ZHU Rongguo [2612 2837 0948]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Flow-field Line Relaxation Solution for S_2 Relative Stream Surface with the Splitter Boundary Condition"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 253-255

TEXT OF ENGLISH ABSTRACT: Based on Wu's general three-dimensional turbomachine flow theory, a computer program of flow field matrix line relaxation was established for flow along the relative stream surface S_2 of ducted fans in the bypass engine.

The development of that considered in a previous article by the author and the splitter boundary condition of the fan compressor was considered, resulting in the improvement of the structure of the computer program.

AUTHOR: LI Keming [2621 0344 2494]
ZHAO Quanchun [6392 0356 2504]
SUN Yuanying [1327 0337 2819]

ORG: All of Shenyang Aeroengine Research Institute

TITLE: "Effect of Casing Treatment on Performance of an Axial Compressor"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 256-258

TEXT OF ENGLISH ABSTRACT: An experimental investigation was conducted, that is reported in this paper, to obtain the effectiveness of four treated casing configurations on performance of an axial compressor. Tests show that the surge margin and distortion tolerance for the axial compressor are improved by means of casing treatment, so that the circumferential pressure profile is further improved and the peak efficiency of the compressor is almost unaffected. There is a common trend for the four treated casings, i.e., the increment in surge margin at lower speed is greater than that at higher speed; the increment in surge margin with distorted inlet flow is more than that with uniform inlet flow.

AUTHOR: TIAN Minhua [3944 2404 5478]

ORG: None

TITLE: "A Calculation Method for the Rocket Engine's Optimum Thrust Nozzle Contour Design"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 259-261

TEXT OF ENGLISH ABSTRACT: Combining the characteristic method with variation principle and applying it to supersonic flow field, a calculating method is presented for the optimum-thrust-nozzle contour design. This method can be used to design nozzle contours with various throat curvature radii and expansion area ratios. It is especially suitable for the design of nozzle contour with large expansion area ratio.

AUTHOR: WANG Buxuan [3769 5943 1357]
REN Zepei [0117 3419 7198]

ORG: Both of Qinghua University

TITLE: "Research of the Application of Twin-plate Device for Measurement of the Thermal Conductivity to Determine the Thermal Diffusivity of Insulating Materials"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 262-268

TEXT OF ENGLISH ABSTRACT: In this paper, a theoretical analysis of the transient process after change of heating rate in a twin-plate device for measurement of thermal conductivity is reported. The influence of heat capacity of the electric heater on the transient temperature distribution in the test plate is discussed. Based on these analyses, a method for determination of the thermal diffusivity of insulating materials with the twin-plate device is proposed.

AUTHOR: MA Tongze [7456 0681 3419]
ZHANG Baodong [1728 0202 2767]
AN Zhiqing [1344 1807 3237]
et al.

ORG: All of the Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "Heat Transfer and Friction for Turbulent Flow in Annuli with Repeated-Rib Roughness"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 269-275

TEXT OF ENGLISH ABSTRACT: Experimental investigation for heat transfer and friction coefficients has been performed for repeated-rib roughness in an annular turbulent air flow in which the inner surface is rough and the outer surface is smooth. The sectional shape of the ribs is trapezoidal. The relative rib spacing s/h varies in the range of 8-17 and the Reynolds number in the range of $1 \times 10^4 - 1.5 \times 10^5$. The correlations for heat transfer and friction have been developed. The film heat transfer coefficients for rough annuli are 1.5 - 2.1 times those of smooth annuli.. The thermal performance has been analyzed.

AUTHOR: FENG Zuyi [7458 4371 3976]
SHANG Shanzui [0794 0810 2584]
et al.

ORG: FENG of the Shanghai Light Industry Design Institute; SHANG of the Shanghai Ship Research Institute; et al.

TITLE: "Preliminary Tests on Coal-Oil Mixture and Its Mechanism Studies"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 276-279

TEXT OF ENGLISH ABSTRACT: This paper merely presents a general picture covering mechanical propeller stirring apparatus, liquid whistles, piezo-electric transducers to prepare COM and use of an ultrasonic atomizer for combustion tests and its preliminary mechanism studies. Our main purposes in researching and developing COM fuels are as follows: (1) Saving liquid petroleum-fossil fuel consumption, (2) broadening the scope of use of different kinds of coal, and (3) utilizing COM as fuel for existing oil-burning boilers, industrial furnaces, etc., with minor modifications before coal gasification or coal liquefaction technique becomes commercially practicable.

AUTHOR: ZHU Changqing [2612 7022 7230]

ORG: Northwestern Polytechnical University

TITLE: "Calculation for the Wall Temperature of Turbo-jet Flame Tubes"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 280-282

TEXT OF ENGLISH ABSTRACT: This paper prepares a method for calculating the wall temperature of turbo-jet flame tubes and prepares a simple method for calculating the wall temperature profile of flame tubes.

AUTHOR: HE Guanhu [0149 0385 5706]
YE Qinghe [5509 1987 0735]
DI Zhongqi [6732 1813 6386]
et al.

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "The Measurement of Specific Heat by Laser Pulse Heating-Cooling Method (500-1200 K)"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 283-289

TEXT OF ENGLISH ABSTRACT: A new method of measuring specific heat, i.e., laser pulse heating-cooling method, is described in respect to its principle, experimental equipment and specimen preparation. The relationship between C_p/ε_n (C_p--specific heat, ε_n--effective emissivity) and temperature (500-1200 K) has been measured with pure iron as a standard material, and thus the value of ε_n may be obtained. The average square root deviation of the experimental value of C_p/ε_n is ±3.3 percent. The specific heat of pure copper was measured by this method and compared with that reported in the literature.

AUTHOR: TAN Zhicheng [6223 1807 6134]
ZHOU Lixing [0719 4539 1630]
YIN Anxue [1438 1344 1331]
et al.

ORG: All of Dalian Institute of Chemical Physics, Chinese Academy of Sciences

TITLE: "An Automatic Adiabatic Calorimeter from 80 to 400 K and Heat Capacity Measurements of Complex Thermal Control Materials for Spacecraft"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 290-297

TEXT OF ENGLISH ABSTRACT: A precision adiabatic calorimeter for heat-capacity measurements of solids and liquids from 80 to 400 K has been constructed. The sample container of the calorimeter is made of pure silver, 0.3 mm thick, gold-plated and polished, with a volume of about 40 ml and a total weight of about 50 g.

The temperature and electric energy supplied are separately measured by two sets of precision potentiometers. The heating interval is controlled and measured automatically with an electronic timer. The control of adiabatic condition is carried out automatically by the Model DWT-702 precision temperature controller. The temperature difference between the thermal shield and the sample container could be kept within ± 0.001 K.

[Continuation of GONGCHENG REWULI XUEBAO No 3, Aug 81 pp 290-297]

The measurements of heat capacity of α-Al_2O_3 (purity 99.993 percent) prove the precision to be ± 0.04 percent and give an accuracy of ± 0.2 percent. With this calorimeter we have measured the heat capacities of 11 complex thermal control coatings, thermo-insulation and ablative materials for spacecrafts. All the figures and tables of the data are given and a formula for estimating error has been derived in this paper.

AUTHOR: ZHAO Lan
et al.

ORG: None

TITLE: "An Apparatus for Measurement of Mean Specific Heat at High Temperatures"

SOURCE: Beijing GONGCHENG REWULI XUEBAO [JOURNAL OF ENGINEERING THERMOPHYSICS] in Chinese No 3, Aug 81 pp 298-300

TEXT OF ENGLISH ABSTRACT: A description is given of an apparatus used for determining the mean specific heat of solids in the temperature range of 800-2600°C. The specific heat of graphite, carbon, Nb Alloy D-43 and N_b-752 were measured with this apparatus and the relative error is less than ± 3 percent.

9717
CSO: 4009/59

Mechanics

AUTHOR: HUANG Kezhi [7806 0344 2535]
ZHENG Zhaochang [6774 0340 2490]

ORG: Both of Qinghua University

TITLE: "General Instability of Ring-stiffened Cylindrical Shells Subject to Hydrostatic Pressure"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 271-286

TEXT OF ENGLISH ABSTRACT: This paper presents a method for calculating the buckling load and mode shape of a ring-stiffened circular cylindrical shell subject to hydrostatic pressure. According to the composite structure method, a set of differential equations for the stability of rings and interring shell segments is established separately. With the height of the ring cross section, eccentric distance, sum of cross sectional area ΣF_r and sum of bending rigidity $\Sigma E_r I_{Gra}$ kept constant, the number of rings is assumed to tend to infinity, and an equivalent orthotropic shell with appropriate elastic constants is obtained as a zero-order approximation. In addition, we can seek for the solution of equations for the ring-stiffened shell in the form of a series. The first term of the series corresponds to the zero-order approximation, i.e., the solution of the above-mentioned equivalent orthotropic shell. The remaining terms represent the correction of various orders,

[Continuation of GUTI LIXUE XUEBAO No 3, Aug 81 pp 271-286]

which may serve as an indication of the error arising from substituting the real ring-stiffened shell with the equivalent orthotropic one. Finally an example is given and a comparison is made between our results and those by other authors' methods. Our theoretical results indicate a good agreement with the experimental data.

AUTHOR: FAN Fuqun [5400 6346 5028]

ORG: South China Polytechnical Institute

TITLE: "The Load Concentration Factor and the Statistic Theory of Crack Propagation of a Unidirectionally Fiber-reinforced Composite"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 287-295

TEXT OF ENGLISH ABSTRACT: This paper discusses two principal viewpoints concerning the statistic theory of crack propagation of a unidirectionally fiber-reinforced composite. One is the calculation of stress redistribution due to sequential fiber breaking. By using the model common in shear-lag investigations, both the plastic analysis by the deformation theory and the elastic analysis are made. The results of the elastic analysis agree with those obtained by J. M. Hedgepeth. Also, studies are made on the development of a crack propagation model. The Gucer-Gurland-Rosen Chain Model is abandoned while a model of gradually enlarging crack layer is presented. Then, through performing a statistic analysis by referring to the method used by A. S. Argon, et al., a formula for calculating the tensile strength of a unidirectionally fiber-reinforced composite is obtained.

AUTHOR: WU Wenzhou [0702 2429 0719]
SUN Jue [1327 3778]

ORG: Both of Taiyuan Polytechnical Institute

TITLE: "An Analysis of the Stress Field of the Human Knee Joint"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 296-301

TEXT OF ENGLISH ABSTRACT: In this paper, a two-dimensional built-up structure model consisting of plates of different material constants is developed for the human knee. The finite element method is adopted to analyze the stress field. The results obtained are: a) for the tibial plateau, both the maximum compressive and maximum shear stress are on the lateral plateau; b) the surface load on the subchondral bone of the femur is transmitted almost directly to the subchondral tibial bone; c) the stress distribution in the articular cartilage is uniform; d) the effect of the lubricant liquid is not taken into account, but the results obtained show that there is practically no shear stress on the tibio-femoral contact surface.

AUTHOR: LU Zhongming [7120 1813 2494]

ORG: Shanghai Power Plant Equipment Research Institute

TITLE: "Determination of the Flexural Center of Blade Profiles by Non-orthogonal Coordinate Difference Method"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 302-311

TEXT OF ENGLISH ABSTRACT: The flexural center of sections with complex curved boundaries like those of blade profiles is calculated by obtaining solutions for stress functions and warping functions with a non-orthogonal coordinate difference method.

To determine the flexural center, a number of lattices that approach in shape the given boundaries should first be chosen and an appropriate non-orthogonal coordinate system taken. Then, after difference schemes are derived with the help of loop integrals in the mesh region, solutions are found by a direct method for sets of the symmetric bond type linear algebraic equations obtained, and Romberg's formula is used to numerically integrate the functional values of the mesh points. In conclusion, to demonstrate the precision of the proposed method, some elliptic and semicircular sections are treated and the calculated values satisfactorily approach those of exact solutions.

AUTHOR: FANG Tong [2455 0681]

ORG: Northwestern Polytechnical Institute

TITLE: "Modal Analysis for Linear Damped Systems with Many Degrees of Freedom"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 312-316

TEXT OF ENGLISH ABSTRACT: In this article, discrete linear nonconservative systems with unsymmetrical matrices are considered. By making use of the properties of the adjoining matrices, the complex modal expansion formula for the transfer function matrix has been derived with ease.

AUTHOR: ZHANG Wen [1728 2429]

ORG: Fudan University

TITLE: "Linearization of the Impact of Elastic Systems"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 317-325

TEXT OF ENGLISH ABSTRACT: The impact of elastic systems is a complicated nonlinear phenomenon. By an analysis of the fundamental central impact of two elastic solids, we have demonstrated that this nonlinear impact phenomenon may be linearized, qualitatively and quantitatively, with an equivalent spring and an equivalent initial velocity. Thus, the impact problem of elastic systems may be reduced to an appropriate free vibration initial value problem for a linearized system, for which the general solutions are deduced in this paper. Numerical examples show that the method proposed is both simple and efficient.

AUTHOR: CHEN Wanji [7115 8001 0679]

ORG: Engineering Mechanics Research Center, Polytechnic Institute of Dalian

TITLE: "An Analysis of Coupled Thermal-elastic Contact Problems with the Finite Element Method"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 326-336

TEXT OF ENGLISH ABSTRACT: In the analysis of thermal load in heated elastic bodies contacting each other, it is necessary to consider the complex contact heat conducting condition as well as the elastic contact condition in addition to taking into account the coupling effect.

A very effective approach, the mixed finite element method, is proposed in this work. The calculated results show that in solving such a class of problems with complex nonlinear boundary conditions by this method, the calculating and storing time is slightly longer than or equal to that when solving thermal load problems of general linear continuous bodies.

AUTHOR: LIU Yanzhu [0491 1693 2691]

ORG: Shanghai Jiaotong University

TITLE: "Nutational Motion of Dynamically Tuned Gyroscope"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 337-342

TEXT OF ENGLISH ABSTRACT: The dynamically tuned gyroscope is a system of rigid bodies restrained by elastic torsional elements, the torsional moments of which are being compensated for by the dynamically tuning effect. The nutational motion of the gyroscope is discussed by an asymptotic method containing two time scales. The criterion of stability is given and the nutation-drift phenomenon as well as its influence on the tuning condition is treated.

AUTHOR: WANG Dajun [3769 1129 6874]
REN Junguo [0117 6874 0948]
CHEN Ping [7115 1627]

ORG: All of Beijing University

TITLE: "Vibration Analysis of Shells of Revolution by the Modal Synthesis Method"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 343-351

TEXT OF ENGLISH ABSTRACT: This paper suggests a modal synthesis method for calculating natural vibration and seismic response for a shell of revolution. The procedure is based on an earlier work. The generator of the shell may be of any form, even one consisting of piecewise curves, but the stiffness and mass matrices of the shell still keep the quasi-diagonal advantage.

The paper presents a computer program by the authors and a numerical example illustrating the effectiveness of this method.

AUTHOR: WANG Jizhong [3769 1323 0022]
ZHANG Wenzhi [1728 2429 0037]

ORG: Both of Shandong Engineering Institute

TITLE: "Separation of the Absolute Retardation Fringes by Using Polarizing Holography"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 352-357

TEXT OF ENGLISH ABSTRACT: A new method for separating the absolute retardation fringes by using polarizing holography is presented. With this method, Nisida's pattern and the two-family absolute retardation fringes can be directly observed through a single double-exposure hologram. If a linear polarizer is placed between the hologram and the observer while the polarizer is being rotated, the absolute retardation fringes on those points where the transmission axis of the polarizer is parallel to a principal stress can also be observed, so the two-family absolute retardation fringes can be separated accurately in the whole model.

The general expression for the light intensity of the reconstructed virtual image through the polarizer is derived by using the Jones vector and matrix calculus. Finally experimental results are presented.

AUTHOR: HUANG Yuying [7806 3768 4134]
JIN Mengshi [6855 1125 4258]
LEI Guopu [7191 0948 3877]

ORG: All of Wuhan Huazhong Institute of Technology

TITLE: "The Theory of Post-buckling of Structures and Its Prospects"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 397-408

TEXT OF ENGLISH ABSTRACT: In the last 10 years and more, the general theory and application of elastic post-buckling have been advancing fairly rapidly. Since it has solved many an important problem never before solved by any classical theory of buckling, people in various circles (mechanics, structure and mathematics) are attaching ever-increasing importance to it. Harvard University and the University College of London have both set up research groups working on this topic. This paper describes the historical background against which the post-buckling theory has been developed, its analytical methods and the prospects for the theory.

AUTHOR: WANG Zhenming [3769 7201 7686]

ORG: Institute of Mechanics, Chinese Academy of Sciences

TITLE: "The Calculation of a Composite Cylindrical Shell of Steel and Concrete"

SOURCE: Wuhan GUTI LIXUE XUEBAO [ACTA MECHANICA SOLIDA SINICA] in Chinese No 3, Aug 81 pp 409-420

TEXT OF ENGLISH ABSTRACT: In this paper, we used a composite cylindrical shell of steel and concrete for large floating cover oil tank to investigate the stress analysis problem of a bilayer cylindrical shell under the action of liquid pressure, temperature difference and the contraction of concrete. An example of calculation of an oil tank of $2 \times 10^5 M^3$ is given to illustrate the advantages of this composite structure.

9717
CSO: 4009/52

AUTHOR: LIAO Pinjun [1675 0756 6874]

ORG: Department of Mining and Mineral Engineering

TITLE: "An Electrochemical Study of the Oxidation of Violarite Surface and the Interaction of Violarite Surface with the Reagents"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 1-8

TEXT OF ENGLISH ABSTRACT: In this paper, triangular potential sweep and Eh-pH diagram are used to study the conditions of oxidation and stability of violarite surface, the mechanism in the interaction of potassium ethyl xanthate (KEtX) on violarite electrode and the effect of Mg^{2+} or magnesite slime on the reaction of KEtX on violarite surface. The results obtained can be regarded as the fundamental data for flotation research of such nickel sulfide ores.

AUTHOR: CHEN Wanxiong [7115 8001 7160]
CHEN Jin [7115 5660]
YU Xuehua [0151 7185 5363]
et al.

ORG: All of the Department of Mining and Mineral Engineering

TITLE: "A Study of the Reaction Order of Flotation Rate"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 9-18

TEXT OF ENGLISH ABSTRACT: In the flotation rate equation $\frac{d\varepsilon}{dt} = K(\varepsilon_\infty - \varepsilon)^n$, the "n" value of flotation rate equation was determined experimentally. Flotation tests were run in a modified Hollimond tube over hematite materials of various size fractions. Respective reaction orders were obtained.

If K_I is expressed as the first order rate constant of tested materials, as $K_{I_{max}} - K_{I_{min}} > 1.5$, the flotation rate equation of the material composed of different K_I values correlates with the second order reaction, regardless of the continuity of K_I (continuous or discontinuous); when $K_{I_{max}} - K_{I_{min}} < 0.5$, the flotation rate equation fits first order reactions. As $1.5 > K_{I_{max}} - K_{I_{min}} > 0.5$, the reaction order lies between 1 and 2, i.e., in a nonintegral order.

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 9-18]

Reaction orders of the materials composed of various K_I values were summarized in the following table.

Reaction Orders of Materials Composed of Various K_I Values

Size Composition (μ)	Continuity of K_I Value	$K_{I_{max}} - K_{I_{min}}$ (or ΔK_I)	Reaction Order (n)	Notes
I. −100 +10	cont.	3.2 (3,0)	2	Fig.3
II. −20 +10 −100 +76	discont.	3.2 (3,0)	2	Fig.3
III. −76 +10	cont.	3.0 (2,0)	2	Fig.3
IV. −45 +10	cont.	1.5 (1,0)	2	Fig.3
V. −76 +45	cont.	1.2	1—2	Fig.8
VI. −100 +76	cont.	1.0	1—2	Fig.9
VII. −30 +10	cont.	0.7 (0.3)	1—2	Fig.6
VIII. −45 +30	cont.	0.6	1—2	Fig.7
IX. −30 +20	cont.	0.5	1	Fig.1
X. −20 +10	cont.	0.4	1	Fig.1
XI. −200 +150	cont.	0.3	1	Fig.1
XII. −250 +200	cont.	0.1	1	Fig.1

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 9-18]

Hence, the "n" value of flotation rate equation ought to be 1, 2 and 1-2, a non-integral order.

AUTHOR: WANG Changhan [3769 2490 3352]

ORG: Department of Mining and Mineral Engineering

TITLE: "The Study of Several Problems in Ore Drawing with the Theory of the Plastic-stress Limit Equilibrium"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 19-28

TEXT OF ENGLISH ABSTRACT: By the use of the theory of limit equilibrium under the action of plastic-stress, the fundamental law of the movement of broken grounds under drawing and their moving limit have been analyzed and the new viewpoint about the equivalent drawing ellipsoid is pointed out in this paper. Based on granular mechanics, the method of calculating the reasonable structural parameters of the slopes has been carried out and the sublevel caving has also been stated.

AUTHOR: HE Jishan [0149 4949 0810]
BAO Guangshu [7637 0342 3219]

ORG: Both of the Department of Geology

TITLE: "On Current Waveforms Used in Dual Frequency Channel IP Method"

SOURCEL Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 29-37

TEXT OF ENGLISH ABSTRACT: In developing the dual-frequency (DF) channel IP method, we have designed and made a new kind of equipment. The transmitter is operated at two frequencies simultaneously. PFE is automatically calculated and displayed by liquid crystal in dual channel receiver. During the past few years, a number of sets of this equipment were being used in various areas. In this paper, the general form and behavior of DF current are discussed. The DF current can be superposed by two square waveform currents which, however, must be coherent, otherwise false PFE occurs. The ability of various shapes of DF currents to build up polarization is the same. The effect of current unsteadiness on PFE measured with DF channel IP method is much slighter than that measured with customary variable frequency IP method. In fact, it is not necessary to maintain constant current when DF channel IP method is employed.

AUTHOR: CHEN Jida [7115 7139 6671]

ORG: Department of Automation

TITLE: "The State Observer for DC Motor Speed Control Systems with SCR"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 38-47

TEXT OF ENGLISH ABSTRACT: In this paper, the problem is described of a controlled plant identity observer being designed based on the state observer theory presented by D.G. Luenberger. By means of the observer the low noise motor armature current and speed estimation signal may be obtained to realize closed-loop control. Therefore, the current and speed adjuster will be able to be free from the noise disturbance. Also, the filter in the feedback path is not needed. A proper derivative feedback may be introduced into the system to obtain a higher performance index.

AUTHOR: HUANG Zhenqian [7806 2182 6197]

ORG: Department of Chemistry

TITLE: "Potential-pH Diagram for Chalcopyrite-Water System at 25°C"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 48-54, 85

TEXT OF ENGLISH ABSTRACT: The basic principle of making the potential-pH diagram has been elucidated in this paper. The potential-pH diatrams for chalcopyrite-water system at 25°C are also constructed.

AUTHOR: WANG Manxing [3769 2581 2502]
SONG Jisheng [1345 0370 3932]

ORG: Both of the Department of Metal Materials

TITLE: "A Study of the Minimum Reducible Thickness"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 55-62

TEXT OF ENGLISH ABSTRACT: In this paper it is considered that the study of the minimum reducible thickness of a thin sheet should be connected with the rolling conditions and there is presented a mathematical model of the minimum reducible thickness under the multitude-pass rolling condition. It is also found by experiment that there exists a superior zone under the influence at the front end of the workpiece and the authors have made a preliminary analysis of the reason producing such a zone.

AUTHOR: LI Yizhi [2621 0001 2535]

ORG: Department of Mining and Mineral Engineering

TITLE: "Loop Method on Computer in Mine Ventilation Planning"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 63-68

TEXT OF ENGLISH ABSTRACT: In mine ventilation planning, the required total airflow and air quantities of some splits should be calculated in advance and then be fixed; the air quantities flowing in other splits can be distributed naturally. In this manner, the air quantities of all branches, the regulating resistances of the fixed flow branches and the total pressure requirements will be calculated, and then the main fans will be selected reasonably. In this paper the application of graph theory will present the Linearization-Iteration Loop Method for mine ventilation planning. Air quantities of all the free-flow branches will be computed with the mesh-flow solved iteratively and the fundamental-circuits (meshes) matrix, which are not estimated conventionally through experience, and hence this method will give the most economical and reasonable total pressure requirements. The regulating resistances of the fixed-flow branches will then be calculated if these branches exist in the network. For the selection of the main fans, some formulae are given for calculating the reasonable diameter of the rotor $D = C\sqrt{A_f}$, with A_f--equivalent orifice and C--statistical factor obtained currently according

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 63-68]

to the type of the fan. For planning on a computer, the source program with ALGOL has been designed, and an example is given.

AUTHOR: PENG Mingsheng [1756 2494 3932]

ORG: Department of Geology

TITLE: "Calculation of Standard Entropy Value of Oxyacid Salt Minerals"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 69-78

TEXT OF ENGLISH ABSTRACT: Any oxyacid salt minerals can be considered as results of reaction on a single substance composition. Their standard reaction entropy $\Delta S^0{}_R$ with the standard entropy $S^0{}_f$ of a single substance composition has the following relationship:

$$\Delta S^0{}_R = S^0{}_{fA.B} - (S^0{}_{fA} + S^0{}_{fB})$$

We made a series of statistics on standard reaction entropy $\Delta S^0{}_R$ among the bulk volume of oxyacid salt compounds and studied the relationship between them. We discovered that they exhibit an approximative straight line. Applying this relationship we obtained $\Delta S^0{}_R$, $S^0{}_{fA+B}$ as the known value, and thus the standard entropy $S^0{}_f$ of oxyacid salt minerals can be calculated according to the following formulas:

$$-\Delta S^0{}_R = a \cdot f + b$$

$$-\Delta S^0{}_R = K(a \cdot f + b)$$

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 69-78]

$$S^0{}_{fAB} = \frac{\Sigma S^0{}_{fA+B} + \Delta S^0{}_R}{K}$$

In the above formulas, the coefficients of a, b, k, f, etc., can be ascertained by calculation.

Simple silicate minerals could be considered as synthesized results of oxides, therefore we may obtain the following approximative calculation formula:

$$S^0{}_{fMSiO_3 \text{ or } MSiO_4} \simeq \Sigma S^0{}_{f(oxides)}$$

AUTHOR: SHI Zhiyi [4258 1807 0308]
ZHOU Qiumin [0719 4423 2404]

ORG: Both of the Department of Metal Materials

TITLE: "The Calculation of the Liquidus Isotherms in Ga-As-Te System"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 79-85

TEXT OF ENGLISH ABSTRACT: The liquidus isotherms in Ga-As-Te system at 900, 1000, 1150 and 1200°C are calculated according to the quasi-regular solution model by using 21 ternary and 14 binary published experimental data. The agreement of the calculated phase diagram with experimental data is satisfactory. It was attempted to describe the Ga-Te, As-Te interaction parameters as $a+bT+cT^2$ based on the simple solution model, but the calculated results did not improve their agreement with the experimental data, so the quasi-regular solution could be considered applicable to the Ga-As-Te system.

AUTHOR: CHEN Gongwen [7115 6300 2429]
TAN Shuxiang [6223 2579 7449]
SUN Yiping [1327 0001 1627]

ORG: All of the Institute's Analytical Laboratory

TITLE: "A New Type of High Precision Electromagnetic Valve Suitable for Automatic Chemical Analysis"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 86-92

TEXT OF ENGLISH ABSTRACT: A high precision electromagnetic valve consisting of the new valve body has been designed. It is suitable for automatic titration of constant flow-time measuring method as well as general automatic chemical analyzers. Using the oscilloscope and calibration tube method designed by the authors, a comparison was made of the characteristics of different electromagnetic valves and the precision of switches, thereby proving that the new type of electromagnetic valve has a good switch reproducibility (at 6 ml/min flow rate, the relative standard deviation measured with 130 µl calibration tube is <0.1 percent, equivalent to 0.13 µl), and high long-term repetition (after switching 1 million times continuously under 2 meter column pressure, there is no leakage within 24 hours and the precision of the switch generally remains unchanged). When the electromagnetic coil is put in parallel with suitable resistance-capacitance delay time

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 86-92]

circuit, it makes the flowing volume proportional to the time passing the electric current through the electromagnetic valve. The valve can fundamentally improve the reliability of constant flow-time measuring method and greatly increase the precision of the measurement. Being used in other automatic chemical analyzers, it will improve their performance.

AUTHOR: ZHANG Housu [1728 0796 5685]

ORG: Department of Mining and Mineral Engineering

TITLE: "A Comparison between Two Methods of Calculation of Weights in Triangular Network of Measured Angles and Sides"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 93-96

TEXT OF ENGLISH ABSTRACT: There are two kinds of views concerning the ratio of weights of measured sides and angles in the adjustment of a triangular network of measured sides and angles:

1. $P_\alpha = \frac{c}{m_\alpha^2}$ $P_S = \frac{c}{m_S^2}$

2. $P_\alpha = \frac{c}{m_\alpha^2} \left(\frac{\rho}{S}\right)^2$ $P_S = \frac{c}{m_S^2}$

This paper has proved by means of modelling in the computer that the first plan of calculation of the weights is reasonable.

AUTHOR: ZHANG Rubai [1728 1172 2672]

ORG: Chengdu Geological College

TITLE: "The Discovery of Cookeite in Altai Pegmatite"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 97-101

TEXT OF ENGLISH ABSTRACT: Cookeite is a lithium aluminum silicate mineral, a replacement product of amblygonite, spodumen, petalite, elbaite, etc., occurring in rich-Li pegmatite. So far, a report of this mineral has not yet been made in China.

In this paper it is reported that cookeite has been found in the Altai pegmatite. It is pink or purple in color. It is grainy and has massive colonies, white streaks and glassy luster. Moh's number of 2.0 - 2.5, specific gravity is 2.58 (specific gravity bottle).

Under the polarizing microscope it is transparent and colorless. The pleochroic formula of cookeite is Ng = pinkish, Np = Nm = colorless. Absorption formula is Ng > Nm (Np). The mineral is biaxial-crystal positive with Ng = 1.585, Np = 1.575, Nm = 1.580, Ng-Np = 0.01, 2V = 77-83° (calc).

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 97-101]

The chemical composition of cookeite is SiO_2 33.10, Al_2O_3 35.38, CaO 5.07, P_2O_5 4.97, Li_2O 3.80, MgO 1.83, Na_2O 0.78, K_2O 1.50, FeO 0.40, H_2O^+ 12.83, H_2O^- 0.05, total 99.71. According to the calculation of the chemical composition, the crystal-chemical formula of cookeite is $(Li_{2.74}\ Mg_{0.49}\ Ca_{0.99}\ Na_{0.27}\ K_{0.34}\ Fe^{2+}_{0.05}\ Al_{6.21})_{11.09}\ (Si_{5.96}\ Al_{1.30}\ P_{0.74})_8\ O_{20}\ (OH)_{15.50}$.

The strongest X-ray powder lines are 6.977(4,002); 4.678(7,003); 4.458(5,020); 3.516(9,004); 2.805(5,005); 2.331(10,006); 1.630(5,240); 1.485(9,060,138). The unit-cell parameters are a = 5.12 A, b = 8.85 A, c = 14.14 A, β = 97°.

In the paper curves of DTA, infrared spectra of cookeite are also presented.

AUTHOR: HU Zhaohuang [5170 2507 3552]

ORG: Department of Basic Courses

TITLE: "The Extension and Application of Ampere's Law"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 102-106

TEXT OF ENGLISH ABSTRACT: The article introduces a general formula which expresses the relationship between the closed line integral of the magnetic field and the conduction current. The formula can be considered as the extension of Ampere's Law. The association of the closed line integral of the magnetic field with the solid angle is the characteristic of the formula. Through actual examples the article illustrates how to use the solid angle for calculating the magnetic field.

AUTHOR: HE Luqing [0149 4389 0615]
DIAO Peiliang [0431 1014 5328]

ORG: Both of the Institute's Analytical Laboratory

TITLE: "A Study of Reliability of Gases Extracted from Inclusion in Minerals by Heating Decrepitation Method"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 107-113

TEXT OF ENGLISH ABSTRACT: In order to improve on the reliability of gases in mineral inclusions being extracted by the heating decrepitation method, the specific effects of extracting temperature on dynamic characteristics of water, carbon dioxide, nitrogen, hydrogen and methane evacuated from inclusions in minerals are investigated in this paper. In addition, chemical reactions between gas and gas as well as gas and solid are also studied through tests of the gaseous mixture.

The investigations of dynamics and thermodynamics show that the gas phase of inclusions is examined in quartz from gold veins which consists mainly of N_2, H_2O and CO_2. However, a considerable part of H_2 and CH_4 found by heating decrepitation method is probably due to chemical reactions and the decomposition of organic matter. In accordance with the calculation of chemical thermodynamics, it is possible that chemical reactions, such as $CO+H_2O \rightleftarrows CO_2+H_2$, $CH_4+H_2O \rightleftarrows CO+3H_2$ and

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 107-113]

$2FeO+H_2O \rightleftarrows Fe_2O_3+H_2$ can take place under the circumstances of the heating decrepitation method. It is demonstrated that the chemical reactions depend on extracting temperature, concentration of gases and presence of water.

The authors have designed a vacuum extraction device for heating decrepitation method. It can prevent chemical reactions. It is possible to extract gases in mineral inclusions reliably.

AUTHOR: DING Biying [0002 4310 5391]
YANG Yanzheng [2799 3601 1767]
LIAO Fengxian [1675 7685 0341]

ORG: All of the Department of Geology

TITLE: "The Fluid Inclusion Study and Metallogeny Review of Gold Deposits in Western Hunan District"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 114-120

TEXT OF ENGLISH ABSTRACT: One hundred seventeen samples from gold deposits were taken up and their fluid inclusion has been studied. The scope of this study comprises the following contents:
(1) sizes, forms and characteristics of gas/liquid ratios;
(2) the determination of the fluid temperatures from the field observation combined with experimental work by means of homogenization and explosion methods. Here this process was divided into four metallogenetic stages. The conclusion is primarily about the paragenesis of major minerals. And the flow directions of mineral fluid have also been predicted.
(3) the study of the composition of inclusions and salinity. The gases are composed of H_2O, CO_2, CO, O_2, H_2, N_2, CH_4, C_2H_2, C_2H_4. The composition of the liquids is the compounds of K^+, Na^+, Ca^{2+}, Mg^{2+}, F^-, Cl^-, SO_4^{2-}, etc. The contents of

[Continuation of ZHONGNAN KUANGYE XUEYUAN XUEBAO No 2, Jun 81 pp 114-120]

heavy metals in the inclusions are Cu, Pb, Cr, Fe, Mn, Au, etc. The concentrations of salts have all been counted and the values of pH and Eh have been determined.

Based on the data of field inclusion study and field geological observation, it can be recognized that the metallogeny of gold deposits in western Hunan district is formed by the permeable mesothermal to epithermal ore fluids.

AUTHOR: LI Shifeng [2621 0013 6265]

ORG: Department of Chemistry

TITLE: "Formulas for Calculating Atomic Radii"

SOURCE: Changsha ZHONGNAN KUANGYE XUEYUAN XUEBAO [JOURNAL OF CENTRAL SOUTH INSTITUTE OF MINING AND METALLURGY] in Chinese No 2, Jun 81 pp 121-126

TEXT OF ENGLISH ABSTRACT: Formulas for calculating the ionic radii, covalent radii, Van der Waals radii and metallic radii from the atomic number are presented.

9717
CSO: 4009/57

AUTHOR: SHENG Zhenbang [4141 2182 6721]
ZHANG Yuncai [1728 0061 1752]
YANG Akang [2799 7093 1660]

ORG: All of Shanghai Jiaotong University

TITLE: "Model Wake Measurement and Wake Quality Assessment"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 1-13

TEXT OF ENGLISH ABSTRACT: The present paper introduces the first part of the research program "Ship Wake Field and Propeller Excited Vibration" carried out at the Ship Hydrodynamics Laboratory of Shanghai Jiaotong University. The instrumentation and method for model wake measurement, wake quality assessment from the point of view of propeller excited vibration are described. In addition, examples of measured results of two models are given in this paper.

AUTHOR: LU Huisheng [7120 1920 3932]
ZHU Wenwei [2612 2429 5588]
FEI Naizhen [6316 0035 2182]
WANG Wenfu [3769 2429 1381]

ORG: All of Shanghai Jiaotong University

TITLE: "Model Wake Measurement and Wake Quality Assessment"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 15-36

TEXT OF ENGLISH ABSTRACT: The present paper introduces the experiments of open rudders carried out at the ship model towing tank of Shanghai Jiaotong University. The main purpose of such experiments is to study the influence of the Reynolds number, depth of immersion, aspect ratio and thickness ratio on the rudder performance. In addition, the comparative experiments are briefly introduced. All the experimental results are given in diagrams. Based on the experimental results and comparison of some existing formulas, the following new formula

$$C_N = K \frac{6}{1 + \frac{2}{\lambda}} \alpha + \alpha \sin^2\alpha$$

for estimating the normal rudder force is proposed.

AUTHOR: WU Xiongjian [0702 7160 1696]

ORG: Shanghai Jiaotong University

TITLE: "Theoretical Estimates and Experimental Methods of the Parameters of Flume Stabilizers"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 37-54

TEXT OF ENGLISH ABSTRACT: For lack of adequate theoretical methods, predictions of flume tank performances are mainly based on experimental means. Based on Watanabe's theory and other different methods given by Goodrich, Lewison and Webster, respectively, the present paper develops a comprehensive model for this stabilizer. Therefore, a tank natural-period formula is derived and tank damping can be estimated theoretically. Attempts to establish simplified roll equations for the tank-ship system without any unknown coefficients are made.

Tank-water motion:

$$\ddot{\tau} + W|\dot{\tau}|\dot{\tau} + \omega_0^2\tau = \omega_0^2\left(\varphi - \frac{H}{g}\ddot{\varphi}\right)$$

Ship roll:

$$\ddot{\varphi} + 2\nu_s\dot{\varphi} + \omega_s^2\varphi - \frac{M_t}{I_\varphi}\tau = \omega_s^2\alpha_m\sin(\omega t + \varepsilon)$$

Period coefficient

$$\lambda = \sqrt{1 + 2r(s-b)\left(\frac{\pi}{4} + \frac{l}{b}\right)\left(\frac{\pi}{B}\right)^2}$$

[Continuation of SHANGHAI JIAOTONG DAXUE XUEBAO No 2, May 81 pp 37-54]

Damping coefficient

$$W = \frac{l+r}{2h_0}\left(\frac{\pi}{\lambda\cos\frac{\omega_0 l}{c_0}} \cdot \frac{2r}{B}\right)^2\left[2\left(2.23\frac{b}{r} + 1\right)\lg\left(\frac{s}{b} + \frac{1}{2}\right)^2 + 1.5\left(\frac{s}{b}\right)^2\right]$$

Anti-rolling moment coefficient

$$M_t = 2\rho g(l+r)\left[2rs\frac{c_0}{\omega_0}\left(\mathrm{tg}\frac{\omega_0 l}{c_0} + \mathrm{tg}\frac{\omega_0 r}{c_0}\right) + \frac{b(Hh_0 - h_0^2/2)}{\cos\frac{\omega_0 r}{c_0}}\right]$$

A specially designed device is used to measure these parameters through the "decaying-motion-moment method" and the forced oscillation test. Experimental results when compared with the relative theoretical values are so inspiring that it is considered possible to design an optimum flume tank for a ship and predict its performances theoretically.

AUTHOR: JIN Dexian [6855 1795 6343]
GU Yongning [7357 3057 1380]
LI Runpei [2621 3387 1014]
HEN Jiwen [7281 4949 2429]

ORG: All of Shanghai Jiaotong University

TITLE: "Static Analysis of Mooring Systems of Semisubmersible Drilling Units"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 55-65

TEXT OF ENGLISH ABSTRACT: Properties of a static anchor chain curve are described by means of catenary theory. The nonlinear displacement stiffness coefficient of the anchor curve and resultant stiffness performance of spread mooring systems are presented. Based on this the numerical solution of static analysis of spread mooring systems is then found. The application of the method is illustrated by the analysis of mooring system of the semisubmersible drilling unit *Nanhai*-2.

AUTHOR: ZHOU Jian [0719 0256]
JIANG Ciping [1203 2945 1627]
SHENG Zhenbang [4141 2182 6721]
et al.

ORG: All of Shanghai Jiaotong University

TITLE: "Experimental Investigation of Geosims"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 67-83

TEXT OF ENGLISH ABSTRACT: This paper describes briefly the experimental results of resistance tests, propeller open water tests and self-propulsion tests of five geometrically similar models of a 24,000 DWT oil tanker. The tests were carried out at the Ship Hydrodynamics Laboratory of Shanghai Jiaotong University. The following conclusions reached on the basis of the analysis of experimental results may be useful for future reference in ship model experimental research.
(1) The form factor method (three-dimensional method) is more reasonable that the traditional Froude's method (two-dimensional method) for extrapolating the model to ship resistance.
(2) There is an appreciable scale effect on wake fraction, and the wake fraction decreases as the size of models increases.

[Continuation of SHANGHAI JIAOTONG DAXUE XUEBAO No 2, May 81 pp 67-83]

(3) The scale effect on thrust deduction coefficient is small, which may be considered approximately constant for models greater than 5 meters in length.
(4) The relative rotative efficiency decreases as the size of models decreases, but its scale effect can be neglected when the diameter of the model propeller is greater than 120 mm and the length of the ship model is longer than 4 meters.

AUTHOR: QIN Shiyuan [4440 1102 0337]

ORG: Shanghai Jiaotong University

TITLE: "A Discussion of the Penalty Term of an Optimization Algorithm by External Penalty Technique with Pattern Searches"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 85-98

TEXT OF ENGLISH ABSTRACT: An optimization algorithm and computer program using the external penalty technique with pattern search methods were presented previously by Parsons. In this paper a discussion is made of its penalty term and samples of numerical test problems are given. By the modification of the loss function into a quadratic type, the result has been significantly improved.

AUTHOR: CAO Meiliang [2580 2734 0081]
XIA Taichun [1115 3141 3196]
LIU Yueyuan [0491 1471 0337]
ZHOU Fengbin [0719 7685 2430]

ORG: All of Shanghai Jiaotong University

TITLE: "The Influence of Backing Rudder System on the Open Water Performance of Ducted Propeller"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 99-124

TEXT OF ENGLISH ABSTRACT: In this paper, the results of open water tests of ducted propeller JD8001-70 + Ka4-70 (P/D = 1.0) are given. The duct JD8001, on which a steering rudder, two backing rudders and a strut are mounted, is based on the duct JD7704. The optimum initial angles of the backing rudders and the $\sqrt{B_p-\delta}$ charts corresponding to these angles are given. In addition, some comments on the design of ducted propellers with the backing rudder system of a typical push-boat are made.

AUTHOR: WANG Xiangbao [3076 1651 1405]
SHI Depei [2457 1795 1014]
ZHU Fugen [2612 4395 2704]
LI Longyuan [2621 7893 3220]

ORG: All of Shanghai Jiaotong University

TITLE: "Finite Element Static Analysis of Support Ring Model with Clearance"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 125-136

TEXT OF ENGLISH ABSTRACT: A structure assembled by a sphere, cone and cylinder with support ring was calculated using the finite element axisymmetrical analysis program. It is known that connection of a support ring to a cylinder is somewhat unusual, i.e., along the contact line between the support ring and cylinder, only the ends are welded while the rest face each other. Consequently, they used to be taken as a solid entirety in the calculation, resulting in the fact that the calculation results were not in agreement with the experimental ones. A support ring model with clearance which is capable of exhibiting the feature of the connection between them is presented. The calculated results show that stresses and strains are in good agreement with the experimental ones, and that the calculating model and method are available. As a result, a reasonable explanation why previous results were not so satisfactory has been made.

AUTHOR: XIAO Xi [5135 3356]
YU Baohai [0060 1405 3189]

ORG: Both of Shanghai Jiaotong University

TITLE: "Optimum Design of Tanker Longitudinal Members"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 137-148

TEXT OF ENGLISH ABSTRACT: Optimum design procedure of tanker longitudinal members is used for the two tankers (15,000 tonnage and 50,000 tonnage) constrained by the 1973 Chinese Rules for the construction of sea-going steel ships.

The present article analyzes the variation of the structural weight resulting from the change of longitudinal spacing or longitudinal span. The standardization for the optimum results is performed so that the results are available for use. The computative results show that the weight of tanker longitudinal members is reduced by about 5 percent as a result of optimization.

The article proposes and applies a partially improved SCDD optimum method. This method takes accelerative measures when the optimum point is searched along the negative gradient of synthetical constraint function by the SCDD method. Therefore, the computative speed is increased and better results have been obtained.

AUTHOR: YANG Daisheng [2799 0108 4141]

ORG: Shanghai Jiaotong University

TITLE: "Probabilistic Approach to the Estimation of Ship Strength"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 149-156

TEXT OF ENGLISH ABSTRACT: For convenience, a weibull function is taken as the probability density function of the wave bending stress in ship structure as was done by Alaa Mansour and others. The probability of ship failure is derived on the assumption that, as the total stress is beyond the yield point of hull steel, the failure of ship structure will occur while taking account of the random characters of the mechanical properties of hull steel. This probability can be applied to the estimation of ship strength.

AUTHOR: YANG Zongying [2799 1350 5391]

ORG: Shanghai Jiaotong University

TITLE: "Stability Cross Curve Programming System of the Mobile Drilling Units"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 157-172

TEXT OF ENGLISH ABSTRACT: The main differences in stability analysis between the mobile drilling units and normal ships are described in the present paper. The mathematical models, calculation methods and principles of the stability cross curve for the semisubmersible drilling platforms with hulls and caissons and jack-up drilling platform are presented. Based on this, the computer program is formulated. Transverse, longitudinal and diagonal stability cross curves are calculated for the semisubmersible drilling platform with lower hulls. In the case of the semisubmersible drilling platform with caissons and the jack-up drilling platform, the stability dross curves are calculated at every 15° from 0-180° in the direction of the X-axis. Two calculation examples are provided, and the calculating method is more convenient to follow, which may be applied to the engineering calculation, especially to preliminary designs, though it is found that the results are not in as good agreement as would be expected from the hand calculations.

AUTHOR: ZHU Yonge [2612 3057 8340]
WANG Xiling [3076 1585 7881]

ORG: Both of Shanghai Jiaotong University

TITLE: "The Criterion of U or V Degree of Forebody Sections of Ships"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 173-186

TEXT OF ENGLISH ABSTRACT: In this paper a parameter relating to the U or V degree of forebody sections of ships is obtained by analyzing the hull form information of several well-known series of ship models and a few actual ships. The presented measure number d derived from this parameter may be used to judge the U or V degree of forebody sections of ships with different fullness. In designing an ordinary ship form, particularly in the case of computer-aided design, the desirable U or V degree of forebody sections can be managed in advance by fixing a corresponding measure number.

Some examples given at the end of this paper illustrate its application with excellent results.

AUTHOR: CHEN Tieyun [7115 6993 0061]
ZHANG Shengkun [1728 5110 0981]
QIAN Rengji [6929 3095 0529]

ORG: All of Shanghai Jiaotong University

TITLE: "The Review and Development of a Ship's Computational Structural Mechanics"

SOURCE: Shanghai SHANGHAI JIAOTONG DAXUE XUEBAO [JOURNAL OF SHANGHAI JIAOTONG UNIVERSITY] in Chinese No 2, May 81 pp 187-199

TEXT OF ENGLISH ABSTRACT: In this paper, the situation of the finite element method in analysis of ship structures has been reviewed. In addition, the prospect of a ship's computational structural mechanics is given and, especially, the new methods of design and analysis of ship structures, the development of numerical methods, structural optimization and structural analysis program of general purpose are introduced.

9717
CSO: 4009/42

END

JPRS 79539

27 November 1981

China Report

SCIENCE AND TECHNOLOGY

No. 138

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79539

27 November 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 138

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Problems in Development of Computer Science Discussed
(Chen Shukai; ZHONGXIAOXING JISUANJI, No 4, 1981) 1

DJS 240, 260 Pass Evaluation
(JISUANJI SHIJIE, 5 Nov 81) 9

North China Terminal Equipment Company Founded
(JISUANJI SHIJIE, 5 Nov 81) 11

PUBLICATIONS

Table of Contents of 'ZIDONGHUA XUEBAO' No 4, 1981 12

Table of Contents of 'ZHONGXIAOXING JISUANJI' No 5, 1981 14

Table of Contents of 'DADIANJI JISHU' No 5, 1981 16

ABSTRACTS

BUILDING STRUCTURE

JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE], No 5, 1981. 18

DAMS

DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS], No 3, 1981 21

ENERGY

TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA], No 4, Oct 81 ... 24

GEOLOGY

DIZHI LUNPING [GEOLOGICAL REVIEW], No 5, 1981 26

INTERNAL COMBUSTION ENGINE ENGINEERING

NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING], No 3, 1981 28

IRON AND STEEL

GANGTIE [IRON AND STEEL], No 9, 1981 33

LASERS

JIGUANG [LASER JOURNAL], No 9, Sep 81 38

MACHINE TOOLS

JIXIE ZHIZAO [MACHINERY], No 9, 20 Sep 81 39

MECHANICAL ENGINEERING

JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING], No 3, 1981 40

METALLURGY

JINSHU RECHULI [HEAT TREATMENT OF METALS], No 10, 25 Oct 81 43

NONDESTRUCTIVE TESTING

WUSUN JIANCE [NONDESTRUCTIVE TESTING], No 4, 1981 44

NUCLEAR TECHNIQUES

HE JISHU [NUCLEAR TECHNIQUES], No 5, Oct 81 48

WELDING

HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION], No 2, Jun 81 50

PROBLEMS IN DEVELOPMENT OF COMPUTER SCIENCE DISCUSSED

Shenyang ZHONGXIAOXING JISUANJI [MINI-MICRO SYSTEMS] in Chinese No 4, 1981 p 35-38, 12

[Article by Chen Shukai [7115 2885 2818], secretary for academic affairs of the Chinese Computer Society: "A Discussion of Several Problems in the Course of Development fo Computer Science and Technology in Our Nation"]

[Text] Learning a little materialists dialectics and the materialist view of history and using this scientific method of knowledge to explore some problems in the course of development of computer science and technology in our nation are beneficial. This article will talk about some viewpoints from several sides. It is not an overall discussion, there may be mistakes, and correction are welcome.

I. The computer industry in our nation began in 1956. The history of 25 years of development can generally be divided into four stages. From 1956 to 1958, from nothing to something, a research organization was established to train scientific research and technical forces, and an electron tube computer was built according to Soviet blueprints. It was a period of budding, establishment and laying the foundation. The period from 1958 to 1966 was a period of development. Achievements were great, and some deviations began to emerge. While purging the "leftist" mistakes, we must not underestimate the achievements. During this period, a series of technological foundations were established: A technological team was trained in scientific research, production, application and education related to computers; corresponding organizations were established; a thousand computers were developed and manufactured; applications in some fields were developed, and these served in several sectors of national defense and the national economy. This writer believes that among the problems that emerged during this period were the following: During this period there was lack of study of the patterns of development of computer science. The proportion of the distribution of forces of the branches of the science was inappropriate; for example, insufficient attention was paid to peripheral equipment, software, basic research and the development of applications, and onesidedness was evident in the internal configuration of the hardware. The various links of scientific research, production, and use did not form a lively closed loop feedback chain. Development of applications was not carried out in a big way; national defense applications, military applications and scientific computation were not transformed into applications in the national economy and applications centered around data processing. The years between 1966 and 1976 were the 10 years of upheaval, as everyone knows; there was destruction and standstill, and at the same time, the leftist guiding ideology also developed to an extremely serious degree. This is an analysis of the whole situation. We do not exclude the fact that individual projects were developed during this period which achieved some results.

The period from 1976 to the present can be further divided into the first 2 years and the last 2 years. During the first 2 years, the "leftist" guiding ideology was still evident in such phenomena as not actually catching up and blind introduction of foreign technology. After the Third Plenum, especially after the Working Conference of the Central Committee at the end of 1980, we began to purge these leftist mistakes at the roots. This is a good beginning that has not been easy. Reorganization began, and this directed computer science and technology onto a healthy and serious track suiting objective patterns.

The major problems manifested were those of rushing, aiming high and superficiality. Rushing means rushing to seek achievements, rushing to become successful for gain, but achievements were sacrificed for speed. Aiming high means aiming at lofty goals unilaterally (actually not lofty goals but impossible to be true lofty goals), and impractically high speed. Superficiality means seeing only the surface or one side of a problem; there was subjectivism, but hard work in studying and exploring the objective patterns of development was scarce or nonexistent. Of course, in the scientific and technological realm, there was an even deeper level of leftist mistakes, such as the views regarding the nature of science and technology, and the debate as to whether scientific and technical prsonnel were the masters of society or the target of "movements" and subjects of criticism, etc. These were all common things in scientific and technological circles. This article is aimed at emphasizing the analysis of some individual technical problems in computer science.

While emphasizing the purge of leftist mistakes, we must also pay attention to correcting other mistakes. In considering concrete problems and events, we must start out from the actual situation; we cannot use one frame of mind to fit all. Things in this world are not uniformly the same.

II. The computer, from the birth of the world's first unit to the present time, has a history of 36 years. The period from the emergence of the idea of the principles of programmed computational operations and memory functions to the present was only a little over 100 years. Are there any patterns or any visible characteristics in the course of development? The answer is affirmative. Let us first analyze modern science and technology of the past 100 years. Science and technology are an aspect of human social activity. The ancient times had ancient science and technology. From the time of the emergence of capitalism, the 16th and 17th centuries, up to the first half of the 19th century should be called the period of recent science and technology. In ancient science and technology, people's understanding of nature and the development of production techniques was very incomplete, the understanding of nature was onesided. To connect these understandings to form a unified understanding of nature required the addition of many hypotheses and guesses. And these were limited by the level of the whole productive abilities of the time. Experiments using precise and automated observations and analytical computations were not possible. Recent science and technology still used and could only use basically this type of research method, which was to take out objective things and events, natural phenomena and physical processes from the whole, temporarily not considering their development, for concentrated study of their current change. Many individual and partial phenomena can be observed and experimented with. Intellectual activity of the individual can discover scientific rules within a definite scope and under definite conditions. The history of development of recent science and technology over several hundred years contributed greatly to human civilization and progress. A large number of scientific achievements were realized. But the 100 years since the second half of the 19th century, and especially modern science and technology formed during the decades after World War II, are characterized by advances from individual handicraft industries via the management method of collectivization to an era of national and even international macroscience. Whether in scientific research, production or application, they all frequently require large-scale and mutually coordinated experiments to advance from individual operations to socialization. (Of course, this does not exclude the basic sciences, some of which can be studied by an individual or a few people independently, but they are also beginning to need complex technical support systems).

The visible characteristics of the development of modern science and technology are:

1. The continuous strengthening of the degree of specialization and comprehensiveness. Understanding of the objective world and reforming the objective world have led to these two contradictions: Specialization and comprehensiveness. On the one hand, to deepen the understnding and recognition of the objective world, the division of labor in science and technology has become finer and finer, and new frontier sciences have continued to emerge. On the other hand, to solve various concrete problems of the national economy and social life, these finely divided specializations must be combined before the various types of problems can be solved. Relying on a certain science and specialization is futile. They all need strong and forceful technological support, they all contain questions about systems and setups, and they cannot be solved by individual effort. Of course, the level of systems and setups still must be developed, the important thing is to grasp the concept of "the borderlines."

2. Science and technology has broadly infiltrated into the economy, society and culture, and commercial transactions. Science is a potential productive force, technology is the means to convert it into a productive force of society; this means that science and technology are a type of productive force, they constitute an important force that seriously affects economic and social activity.

3. The scale, difficulty and cost of scientific and technological research are becoming larger and larger.

4. The period from the realization of modern scientific and technological achievements to the appearance of new products from these achievements has greatly shortened. It can also be said that their movement and change are very dynamic, the half-life of knowledge has greatly shortened. For example, the period from the invention of the electron tube in 1904 to the first electron tube computer (1946) spanned more than 40 years; the period from the invention of the semiconductor transistor to the building of the semiconductor computer was about 10 years; the period from the development of microelectronic precision processing technology to the integrated circuit computer was only 1 to 2 years; the development of the ultramicroprocessing technology to the fourth-generation computer were almost in step. Of course, this trend is not absolute.

5. "Technical breakthrough" types of science and technology have gradually given way to "systemized" types of science and technology. The three major discoveries of the early period (the cell, energy conversion, Darwin's theory) and the major technological breakthroughs from 1925 to 1950 numbered over 40. The levl of technology during the 1940's and 1950's covered atomic energy, computers and semiconductors, space technology and synthetic plastics. These achievements were all technological breakthroughs successfully developed on the foundation of new principles, and they brought about revolutionary change in the whole body of science and

technology. During the first half of the period from the 1950's to the 1960's such new technological breakthroughs greatly decreased; statistical studies of the 1970's show that technological breakthroughs produced by entirely new discoveries and new inventions and relying on new principles became fewer and fewer. From the latter part of the 1970's to the present, it appears tht the scientific principles and technology already possessed are being systematically combined, thus forming new technologies that are completely different from the original technologies. For example, although the basic principles of the computer have been developed greatly, they have not broken away from the ideas of 100 years ago concerning programs and memory storage. Also, as Weber [phonetic] the person in charge of planning the American Apollo missions, said: "The technology of the Apollo spacecraft does not contain even one new breakthrough; all the technologies are based on already existing principles; the key is whether they can be accurately and flawlessly organized and placed under systems control to form a brand new technology." In 1971, the Japanese Science and Technology Agency predicted that the 1980's would be the peak years of systems combination type technologies.

Computer science and technology have more typically and centrally manifested the characteristics of the development of modern science and technology. It is a new technological science that involves an extremely broad range of scientific fields and an extremely strong comprehensive science. It has its own structural strata; it requires the study of basic theory, basic materials, and the basic components. We can say that many physical, chemical, mechanical and biophysical...research results were all quickly absorbed by computer science. Components, whole units, and systems must also be studied, and applications in every realm msut be examined. Therefore, based on the categories of scientific research, there are basic research, applications research, developmental research, and afterward there are product development, mass production, and popularization and application. Scientific research, production and use are mutually connected as a unified whole, i.e., scientific research, economy and social life are dialectically unified. In the unified entity, each of the three has a respective position and definite technology, and they form a nonplanar feedback cycle which rises "spirally".

Because of the lack of research in the objective patterns and their characteristics, the following problems have emerged:

1. Computer science and technology is large and complete, forming its own system. In the macroscientific era in which science and technology have becom socialized, it is difficult to continue the ways of individual handicraft industries, "not seeking any help from anyone". Out nation's computer science and technology needs specialization and division of labor and at the same time it needs overall technical coordination to form a joint economic and technological entity of scientific research, production and utilization. To achieve this is very difficult; the superstructure suitable for this type of development must be established; various obstacles must be overcome, such as the remnant ideology of "feudal separatism", etc.

2. The organic whole and the closed loop feedback links are separated and disjoined, causing an imbalance in ratio. For a long period, in the whole chain, emphasis was placed only on the whole unit, and in the whole unit, emphasis was placed only on computational speed. The viewpoint was, apparently, that if the computer could compute so many millions of operations a second, this would constitute "catching up and surpassing". This view and this way of doing things are very onesided. It is not possible to "catch up and surpass" in this way. Also, continuing in this way for a long time, pursuing one item of one link, will create a vicious cycle, just like destroying the ecological balance in nature.

These problems will necessarily lead to the following results:

1. We cannot talk about the performance price ratio.

2. The boundaries of the various kinds of research are confused. "There are no blueprints and there is no information". Such ridiculous and naive things as propagandizing the manufacture of semiconductor integrated circuits in the lavatory, etc. have emerged.

3. The fine division of labor and combination are violated; products are expected to be immediately effective and to be able to yell and jump. Therefore, over the past dozen or so years, some factories have looked like laboratories, and research institutes have looked like testing shops in factories, causing confusion in the division of labor between the scientific research system and the production and factory system, and preventing them from developing their advantages.

4. The categories of research are violated. Jumping from applied research and even basic applications research to products and engaging in large projects have resulted in an extremely large proportion of trial produced products, high consumption, and long periods of development; but these products cannot really be put into production, and only some gifts, samples and showpieces are produced; they cannot really be part of a productive force in society.

III. Applications must be developed in a big way before the computer can truly develop. The viewpoint of application is the viewpoint of practice. A statement in the theory of the materialist view of history says: Without practice by the masses, it is also difficult for science and technology to develop. In the problem of developing applications, we have not grasped well the key knot and "degree" of qualitative and quantitative change.

The general international experience is that whether application of a nation's computers can rapidly be popularized and serve their proper function in the national economy depends on whether their use can be expanded in these two directions: 1) expanding from military applications to civilian applications (used in all sectors of the national economy); and 2) expanding in content from scientific computation to data processing, information processing, and knowledge processing.

In computer applications, numerical computation (including scientific computations) constitutes only 5 to 10 percent, while non-numerical computations (mainly data processing, information processing...) constitutes about 90 percent. Although the course of development of computers in most nations started out from military applications and then expanded to civilian applications, and went from scientific computations to data processing, the timeliness of the changeover and the speed of change affected the development of the computer greatly. This requires grasping the key nodes and "degree" of the patterns of qualitative and quantitative changes. The United States made the change at the beginning of the 1950's. The Soviet Union began to pay attention to the application of computers in the various sectors of the national economy in 1966, and by 1968 to 1972, application of computers in the Soviet Union had undergone a fundamental change. In 1968, the number of computers used in industry and by enterprises constituted only 9.1 percent of the total number of computers in the nation. But by 1972, the number of computers being used in industry, transportation, construction and agriculture already constituted over 65 percent of the total number in the whole nation.

Our nation's computers were first used in military applications and for solving equations of mathematics and physics. But for over 20 years, until recently, many computer research institutes with relative strength were still developing computers mainly for scientific computations, and it is very difficult to connect them to the needs of the various sectors of the national economy. A change in the emphasis of computer applications in our nation has been advocated by computer circles for many years, but this has not been solved yet. This writer believes this is because of the mainstream leftist mistakes committed for many years in our nation's socialist construction. Under this leftist guiding ideology, business management departments would not listen to the sincere opinions of scientists and would not implement helpful measures; therefore, over so many years, the role of computers has not widened but has become narrower.

A comparison of the changes in application in China, the United States and the Soviet Union is as follows:

	Beginning	Change in application	Remarks
China	1956	End of 1970's	According to the same comparable indicators, our nation is 10 years late in changing
United States	First computer built in 1946	Beginning of 1950's	
USSR	1950	Mid-1960's	

Let us look at the ratio in the production and applications links: The manpower and materials invested in the application of computers in foreign nations are several times the manpower and materials invested in production.

	Major manufacturers	Service companies
China	Over 80	Established in 1980
United States	100 (top 100 manufacturers)	In 1975, 2,550 companies
Japan	Over 300	In 1978, 1,672 companies

Compare the ratio of production personnel and popularization and applications personnel of just one computer company in China and the United States.

	Total	Production personnel	Popularization and applications personnel
U.S. Wang Laboratories	10,000 persons	2,000 persons, 20%	8,000 persons, 80%; software, popularization, applications service constitute 1/3 each
A computer manufacturer in China	7,500 persons	7,450 persons, 99%	40 to 50 persons, 0.6%

In emphasizing the development of applications in a big way and in completing computer applications, onsidedness i these two changes should also be carefully guarded against.

1. Empahsizing application means emphasizing application on the basis of a definite ratio within the system and the structure described in the previous section. Basic research and such efforts should not be relaxed.

2. Completing the change does not mean that numerical computation is no longer important or has become less important. It is very important, and the absolute amount is still increasing. However, because of the rapid development of data processing, information processing and knowledge processing, because of their massive amount and broad scope, the amount of numerical computation as a relative percentage of the total amount of work is decreasing day by day.

IV. The electronic computer, as its name implies, is a machine that utilizes the motion of electrons to carry out computations. Viewed from any direction, this name no longer fits the object it represents. It is only because it is the customary term that we shall temporarily call it that. The computer, in reality, is an automated information processing system. Its content as described above far surpasses the field of electronics. The computer has advanced from numerical computation to information processing, knowledge of the human brain. Artificial intelligence is by nature the future of development of computers. Therefore, the future development of computers comes in contact with fundamental questions of philosophy. The present computers can only be regarded as "having knowledge" but not as having "intelligence" yet. Knowledge is useful information that exists within an individual. Intelligence is the ability to utilize the information to achieve certain specific goals.

The question of the relationship between existence and thought is a fundamental question of philosophy. Existence is primary, it is the origin. Thought is secondary, it is the reflection of existence. Thought is reflected and processed by the highest substance in man--the human brain. If the computer can complete artificial intelligence, then it will be the materialization of thought. This precisely proves the correctness of Marxist philosophy. During the cultural revolution, simulation of human intelligence by the computer was criticized as a question of idealism; it was said that if the computer could achieve artificial intelligence, if it could think, then people would become slaves of the computer. Actually, scientific and technological achievements of the early period--machines--liberated man's physical labor; modern scientific and technological achievements--computers--have partially and conditionally liberated man's mental labor. This is the objective pattern. For example, cars travel faster than man, cutting pliers are stronger than the human hand, but for several hundred years, man's legs and hands have not degenerated but have become more verstile. The computing speed of the computer is much faster than man's, the memory capability is strong, but the computer will never surpass human wisdom. People have given the computer their intelligence and talent, the computer has liberated man's mental labor, it is an extension of human wisdom, making people smarter.

The various big debates in philosophical circles of the Soviet Union directly affected the development of the computer. The Soviet Union criticized the theory of mechanization of the brain; it believed that the development of computers to substitute for a part of the function of the human brain would be an idealistic development. This type of criticism was unfounded in theory, but it delayed the development of computer science and cybernetics in the Soviet Union by 5 to 10 years. It was only after Comrade Stalin died that the Soviet Union built its first computer research institute.

The process of understanding the materialization of man's own brain also coincides with the Marxist theory of knowledge, i.e., the process of practice, recognition, practice, repeated recognition, repeated practice. Actually, the whole history of the development of the computer is a process of continuous understanding of man himself while he changes the objective world. When man's intelligence was not yet materialized, thought was shrouded in mystery. As parts of specific intelligence materialized one after another, the brain was described as a clocklike and gear-type machine. During the 1950's, the human brain was described as similar to the memory of a computer composed of 10^{10} electron tubes. The cerebral cortex has about 10^{10} nerve cells. When the neurophysiologists concluded through scientific research that one nerve cell is linked to about 1,000 nerve cells surrounding it, this nerve cell is equivalent not to an electron tube but to a microcomputer which is linked to 1,000 other microcomputers. Thus, the human brain is similar to a huge information processing network system composed of 10^{10} microcomputers. In fact, such understanding still leaves many questions unanswered, and the tall mountain of intelligence is still before us.

We should conscientiously explore patterns in practice so that objective and subjective views will be consistent. We believe whole heartedly that by following this road with all efforts, our nation's computer science and technology will surely develop healthily and will provide greater service in the four modernizations of the nation.

9296
CSO: 4008/5

DJS 240, 260 PASS EVALUATION

Beijing JISUANJI SHIJIE [COMPUTER WORLD] in Chinese 5 Nov 81 p 1

[Text] (By out own correspondent) DJS 240, 260 computers are medium- and high-grade computers in the 200 series suitable for scientific calculations, real-time control and data processing. The first and second 260 computers, designed by the 200 Series Combined Design Group and built by the Huabei Computer Technology Institute, passed evaluation respectively in August and November 1979 and were delivered to the users. The first 240 computer passed evaluation in January 1981 and was delivered to the users. Production of the third and fourth 260 and the second and third 240 computers has begun. Up to now, four models in the DJS series--DJS 210, 220, 240 and 260--are all available to the customers.

The primary frequency of the 240 computer is 3.3MC. The basic command execution time is between 06µS and 6.6µS. There are 187 commands. Maximum capacity of the main storage is 32K double words x 8. There are a total of 187 subchannels. It can activate at most 240 pieces of I/O equipment. The configuration of peripheral equipment is fairly complete. Software of the entire system is compatible and is equipped with DJS 200XT1, XT2, XT3 systems, DJS 240, 260 real-time operational system, and DJS 200 supervisor. It also has all kinds of generalized and high-level languages.

The primary frequency of the 260 computer is 4MC. The execution time of the basic commands is between 0.25µS and 3.75µS. There are 187 commands. The maximum capacity of the main storage is 32K double words x 4. The channels, peripheral equipment and software are basically the same as those of the 240 computer.

Chinese-made small-scale integrated circuits are employed in the 200 series. Practice has demonstrated that comparatively stable medium- and large-sized computers can be made entirely from these Chinese-made small-scale integrated circuits. Take the 240 computer as an example: The 53150 individual components, totaling 11 different varieties, were assembled after having been checked and screened. Except for a new circuit chips that failed early, the machine has now operated 6,000 hours and, in the main, no components have been replaced. When the computer was delivered for evaluation, it ran as long as 150 hours continuously and the computer was stopped manually. The users were also satisfied with the stability of the 260 computer.

In order to increase the speed of the main frames of the DJS 240 and 260 computers, in addition to employing rationally parallel operation and concurrent calculation, some high-speed calculations, such as 12-bit multiplication and iterative division used on 260 computers, were used, while 8-bit multiplication and iterative division were employed on the 240 computers. The 240 computer adopted the streamlined technique. More than half the commands can be completed with 250nS preprocessing and processing. For this reason, the average calculation speed of the 260 computer can exceed 1 million operations/ second, while the 240 computer can reach 500,000 operations/second.

CSO: 4008/23

NORTH CHINA TERMINAL EQUIPMENT COMPANY FOUNDED

Beijing JISUANJI SHIJIE [COMPUTER WORLD] in Chinese 5 Nov 81 p 11

[Text] (By our own correspondent) The North China Terminal Equipment Company was founded on 6 October in Baoding City by combining the state-operated Jianshan Machinery Plant and the Baoding Electronic Instruments Plant in Hebei on the principle of volunteering and mutual benefits and in carrying out the joint operations of the Central and local government-operated enterprises. Li Rui [2621 3843], head of the State General Bureau of Computer Industry, attended the inaugural meeting.

The North China Terminal Equipment Company is the first company in the country charged with the task of producing computer terminals. Its equipment is excellent and it has a comparatively strong technical force that has many years of experience in the production of computer peripheral equipment. Establishment of the company will help in serializing and specializing the production of computer terminals and in upgrading product quality and in specializing large scale production.

The company institutes the management responsibility system under the leadership of the board of directors. It has set up technical development, production design, sales service, and finance and supply departments, and two production plants. The technical development department devotes its efforts toward designing, trial producing, and developing new products, such as Chinese character intelligent terminals, all types of CRT displays and DJS060 series microcomputers and single-plate computers. The sales service department will render such services as doing repairs and conducting technical training for the users.

The North China Terminal Equipment Company is located in Baoding City, Hebei Province. It can now supply ZD-2000 Chinese character intelligent terminals, ZD-1110, ZD-1220 character displays and MC6800 series single-plate computers. [Guang Mao; 1684 2021]

CSO: 4008/23

PUBLICATIONS

TABLE OF CONTENTS OF 'ZIDONGHUA XUEBAO' NO 4, 1981

Beijing ZIDONGHUA XUEBAO [ACTA AUTOMATICA SINICA] in Chinese No 4, 1981 inside back cover

[Text] Papers and Reports

The Well-posed Problem in MES Synthesis of Linear Control System......Zhang Rongxiang [1728 2837 4382], Shandong Engineering Institute; Chen Zhaokuan [7115 0340 1401], Shandong University (246)

Robustness of Double-channel LQSF Speed Control System with Observer-based Disturbance Compensator......Gao Long [7559 7893] and Xiong Guangleng [3574 0342 2807], both of Qinghua University (256)

Some Problems in the Order-reduction of Large-scale Systems by Aggregation......Zheng Yingping [6774 2019 1627], Institute of Automation, Chinese Academy of Sciences (265)

The Simulative Study of Adaptive Feedforward AGC System of Hot Strip Mills......Chen Zhenyu [7115 2182 1342] and Zhang Xiandong [1728 7359 2639], both of the Institute of Automation, Ministry of Metallurgy (273)

A Recursive Identification Algorithm for Linear Multivariable Systems......Wang Xiufeng [3769 4423 1496] and Lu Guizhang [4151 2710 4545], both of Nankai University (282)

A Multivariable Self-tuning Filter and Smoother......Deng Zili [6772 5261 4539], Heilongjiang University (293)

On Bad Data Identification Method for Power System State Estimation......Li Xiwu [2621 1585 2976], Electric Power Research Institute (303)

The Mathematical Model and Control of Metal Heating Process ......Song Ruiyu [1345 3843 3768], Institute of Mathematics and Physics, Wuhan; Shao Kezhen [6730 0668 2182], Institute of Design of Middle South Power System (311)

Analysis and Development of a Digitized Costas Phase Locked Loop......Zeng Fengchi [2582 7685 3069], Institute of Automation, Chinese Academy of Sciences (318)

In Memory of Professor Zhong Shimo......Wu Ruyang [2976 3067 2254], et al. (320)

9717
CSO: 4008/25

PUBLICATIONS

TABLE OF CONTENTS OF 'ZHONGXIAOXING JISUANJI' NO 5, 1981

Shenyang ZHONGXIAOXING JISUANJI [MINI-MICRO SYSTEMS] in Chinese No 5, 1981 inside front cover

[Text] A Talk on the Developing Direction of Microcomputer Technology......Li Sanli [2621 0005 4539], Qinghua University (1)

Search After M6800 Microcomputer Family Provided with System Programming Language Modular: A Problem in Implementing Device Modulars......Jiang Mingde [3068 2494 1795], Chengdu Telecommunications Engineering College (9)

Tiny PASCAL Running on SJ-55 Series......Feng Yongxiang [7458 3057 4382] and Dong Liangcheng [5516 5328 2052], both of Shenyang Computation Technology Research Institute, Chinese Academy of Sciences (20)

Do Formula Operations on Computers......Guo Fusun [6753 4395 7311], Tang Yongfang [0781 3057 5364] and Xie Yuanhong [6200 3220 3126], all of the Harbin Institute of Technology (32)

The Action of Microcomputers in System BS 602......Zhu Chuannai [2612 0278 0035], Computation Research Institute, Chinese Academy of Sciences (37)

The Implementation of Hyper-resolving Method in Theorem Proving......Li Weihua [2621 5898 5478] and He Yanxiang [0149 3508 4382], both of the Department of Computer Science, Wuhan University (42)

Cycle Modulation--A New Method With Which Cassette Recorders Record Data......Tong Zhitong [4547 1807 6639] and Sun Dachuan [1327 6671 0278], both of Hangzhou University (47)

File Systems in Bank Operating Systems (Their Design and Implementation)......Zhang Wenkai [1728 2429 1956], Northwest University; Zhang Fan [1728 0416] and Hou Li [0186 7787], both of the Beijing Banking Electronics Test Station (53)

An Improvement on Disk Interfaces when Configurating RDOS on Many Bulgarian Disks ISOT-1370......Wang Mengchao [3769 1322 1560] and Liu Dunjian [0491 2415 0256], both of the Suzhou Computer Plant (60)

A Network to Automatically Select Boards for Memories...... Liu Zhanqing [0491 0594 3237], Shenyang Computation Technology Research Institute, Chinese Academy of Sciences (63)

9717
CSO: 4008/24

TABLE OF CONTENTS OF 'DADIANJI JISHU' NO 5, 1981

Harbin DADIANJI JISHU [LARGE ELECTRIC MACHINERY TECHNOLOGY] in Chinese No 5, 1981 preceding p 1

[Text] 125 MW Hydro-generator Unit of Gezhouba Second-river Power Station......Kuang Peng [6782 7720], Harbin Electrical Machinery Works (1)

The Magnetic Field and Harmonic Analysis of Pole-changing Storage Electric Machine......He Zhaofu [0149 0340 4395], Tianjin Generating Equipment Plant (6)

Differential Protection of 320 MW Hydro-generator for Longyangxia Power Station......Li Meng [2621 5536], He Xinfang [0149 2450 0119] and Xiao Yiguo [5135 0122 0948], all of Dongfang Electrical Machinery Works (12)

The Stator Vibration-proof Construction and Its Application on the QFSS-200-2 Turbogenerator with Water Cooling Rotor and Stator Winding......Song Dianwen [1345 3013 2429], Harbin Large Electrical Machinery Research Institute; Li Yongjun [2621 3057 6511], Harbin Generating Equipment Complete Set Design Institute (18)

Analysis of No-load Stability for Synchronous Generator in Excitation Control System with AC Exciter......Li Chengye [2621 2110 2814], Henan Electric Power Scientific Testing Station (24)

A Discussion of Demand on Electrical Performance for Synchronous Induction Motor Used to Drive Mill......Zheng Shigang [6774 2514 0474], Harbin Large Electrical Machinery Research Institute (32)

The Measurement of Machine Winding Insulation Thickness...... Qian Hanguang [6929 0698 0342], Shanghai Electrical Machinery Works (37)

The Calculation of Francis Turbine Runner Strength by the Finite Element Method......Liu Xinmin [0491 2450 3046], Harbin Large Electrical Machinery Research Institute (40)

The Improvement in Calculating Critical Speed of Hydraulic Turbine Main Shaft......Luo Yuanwen [5012 0337 2429], Huazhong Institute of Technology (47)

The Transient Numerical Calculation Method of the Hydraulic Turbine Regulating System......Ge Hongkang [5504 7703 1660], Dongfang Electrical Machinery Works (56)

9717
CSO: 4008/19

AUTHOR: SHEN Zaikang [3088 0961 1660]
et al.

ORG: None

TITLE: "Fatigue Behavior of the Normal Section of Partially Prestressed Concrete Beams and Its Calculating Method"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 1-13

TEXT OF ENGLISH ABSTRACT: Based on the static and fatigue experiments of 16 pieces of 1-section test beams and 3 pieces of prototype 1-section crane girders, the fatigue behavior of partially prestressed concrete beams has been studied. The stress variations of prestressing steel in the cracking section and the development and closure of flexural cracks under repeated loading have been analyzed. In addition, the calculating method for the stress of prestressing steel and controlling conditions of crack width are also presented in the paper.

AUTHOR: LU Zhitao [0712 1807 3447]

ORG: Nanjing Institute of Technology

TITLE: "Strength Calculation of Reinforced Concrete Members Subjected to Combined Biaxial Bending and Tension"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 14-25

TEXT OF ENGLISH ABSTRACT: Based on analysis and discussion for evaluating the strength of tension members under uniaxial bending, an ultimate strength method for designing symmetrically reinforced concrete members with rectangular section subjected to combined biaxial bending and tension is suggested and the equations used in this method are derived.

Results obtained by the proposed method have been compared with those from tests. The comparison shows that they are in good agreement with the test results.

AUTHOR: WU Zhixian [0702 5267 6343]
HU Qingen [5170 1987 1869]
CHENG Dazheng [4453 1129 2973]
et al.

ORG: All of the Shanghai Institute of Industrial Architectural Design

TITLE: "Building Frame Using Precast Reinforced Concrete Columns of Multistory Height with Cast-in-place Beam-to-column Connections"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 26-37

TEXT OF ENGLISH ABSTRACT: This paper presents a new design of precast reinforced concrete columns of multistory framed structures with exposed sections at each floor level for cast-in-place beam-to-column connections. The design procedure and detail requirements for the reinforcements at the exposed sections of columns used in a recently erected building are described.

This paper also reports experimental results obtained from a full scale test. The experimental results are in close agreement with those predicted by the proposed equations. Brief comments have also been made on connection details.

AUTHOR: WANG Lei [3769 4320]

ORG: Hunan University

TITLE: "Analysis of Strength of Elastic Plates by Least Square Method--Sine Series and Polynomial Try Functions"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 43-54

TEXT OF ENGLISH ABSTRACT: In this paper, sine series and polynomial beam functions are derived. They can satisfy various boundary conditions of beams, such as the simply supported ends, fixed ends and free end. As for elastic flexual plates under various boundary conditions, the undetermined parameters can be solved by the theory of minimization of least square method. Since they satisfy the boundary conditions, they can be considered as try functions of the interior method of weighted residuals.

AUTHOR: LIU Kaiguo [0491 7030 0948]

ORG: Hubei Design Institute of Industrial Buildings

TITLE: "The Computing Method of Interaction of Soil-Foundation-Frame System"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 55-72

TEXT OF ENGLISH ABSTRACT: In this paper, the interaction of soil-foundation-frame system is calculated and a mathematical model is presented, assuming that the stress-strain relation obeys the theory of elastic half-space. The vertical displacement of the frame belongs to the shear type structure. The differential equation is derived therefrom and solved by using finite differences and series.

Numerical examples are given in this paper, and tables compiled by matrix are presented in the appendix.

AUTHOR: PAN Fulan [3382 1788 5695]

ORG: Fifth Design and Research Institute

TITLE: "Determination of the Compressional Stiffness Coefficient in Homogeneous Soil"

SOURCE: Beijing JIANZHU JIEGOU XUEBAO [JOURNAL OF BUILDING STRUCTURE] in Chinese No 5, 1981 pp 73-79

TEXT OF ENGLISH ABSTRACT: In this paper, according to the results of field tests and theoretical analysis, the formulae for calculating the compressional stiffness coefficient in homogeneous are presented from the point of view of variable rigidity. These formulae reflect the properties of soil strata of considerable depth, the computed results are in good agreement with the actual conditions, and the defects in the theory of constant rigidity in computing the compressional stiffness coefficient have been overcome.

9717
CSO: 4009/75

AUTHOR: WANG Chuipu [3769 0987 2883]
ZHANG Xun [1728 3169]

ORG: WANG of the Nanjing Automation Research Institute, Ministry of Electric Power; ZHANG of Nanjing Electric Power and Automated Equipment Plant, Ministry of Electric Power

TITLE: "A Telemetric Type of Displacement Meter Used in Dam Observation"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 5-14

TEXT OF ENGLISH ABSTRACT: In China, in measuring the horizontal displacement of concrete gravity dams and buttress dams, a steel wire is usually mounted in the gallery of the dam as the reference line in observation. We have designed a new type of displacement meter so as to render this kind of dam observation more effective than before. In order to match the requirements of long distance of reference line and a number of measuring points and, at the same time, to reduce error due to those contact measuring devices, the following scheme is adopted in developing a new displacement meter: The horizontal displacement of the dam is measured by a photoelectric device and, with the aid of a differential inductance sensor, the measurand is converted into electric quantities for telemetering. As shown by laboratory and site tests, the meter is of high accuracy and stability.

AUTHOR: LIU Zhibin [0491 5268 1755]

ORG: Water Conservancy and Hydroelectric Power Research Institute

TITLE: "A Miniature Stress Meter for Internal Stress Measurement"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 15-24

TEXT OF ENGLISH ABSTRACT: This paper deals with design, manufacture and application of a miniature stress meter for laboratory tests of structure models.

In order to measure internal stress correctly, the stress meter should satisfy the definite rigidity matching relation, $(E'/E_0)(F'/F_0)(H_0/H') = 1$. Since it is difficult for gypsum to meet the above requirement due to its plasticity, the method of structural design is adopted to reduce error due to incomplete matching.

As shown by experiments, the developed stress meter is in conformity with the required technical specifications. It can measure the tensile stress as well as the compressive stress inside a structure with error less than ±5 percent.

AUTHOR: GONG Weixuan [7895 4850 4821]
CUI Guofan [1508 0948 5400]

ORG: Both of Wuhan Hydropower College

TITLE: "Investigation of Settlement of Dam by Mathematical Statistics"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 25-32

TEXT OF ENGLISH ABSTRACT: In this paper, the treatment and analysis of the observed data for earth dam settlement according to the basic principle of mathematical statistics leads to the conclusion that its optimum curve is a logarithmic one.

AUTHOR: ZHOU Xingbao [0719 5281 1405]

ORG: Yuecheng Reservoir Management Office

TITLE: "Horizontal Displacement Observation on a Reservoir Dam and Its Accuracy Analysis"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 33-45

TEXT OF ENGLISH ABSTRACT: This paper describes the horizontal displacement observation based on triangulation in combination with alignment survey on an earth dam of Yuecheng (County) Reservoir. The accuracy of measurement is assessed through theoretical analysis.

AUTHOR: BIAN Youxin [0593 0642 2450]

ORG: Nanjing Automation Research Institute, Ministry of Electric Power

TITLE: "A Brief Introduction to the YS-1 High Pressure Oedometer"

SOURCE: Nanjing DABAGUANCE YU TUGONGCESHI [DAM OBSERVATION AND GEOTECHNICAL TESTS] in Chinese No 3, 1981 pp 46-48

TEXT OF ENGLISH ABSTRACT: The YS-1 high pressure oedometer is a lever-type consolidation apparatus with lever ratios of 1:10 and 1:12. The sampel area may be 50 or 30 cm^2, on which the maximum stress will come up to 20 and 40 kg/cm^2 respectively.

In testing, the sample is placed in a cell where it is constrained laterally and allowed to drain vertically. A graded axial load is applied to the sample by a lever-loading machine. The YS-1 oedometer can be employed for determining the amount of deformation and the relation between deformation and time.

9717
CSO: 4009/78

AUTHOR: NI Shouyuan [0242 0649 0337]
CHANG Zhenyan [1603 2182 3508]
CHEN Zhongya [7115 1813 0068]

ORG: All of the Institute of Electrical Engineering, Chinese Academy of Sciences

TITLE: "Variable-speed Constant-frequency Wind Generating Systems Utilizing Field Modulated Generators"

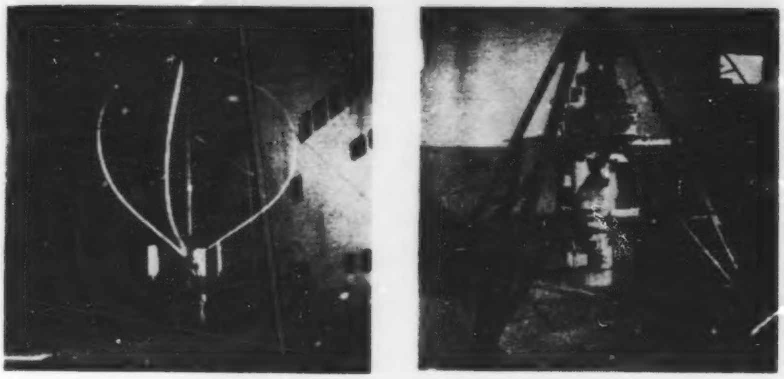
SOURCE: Beijing TAIYANGNENG XUEBAO [ACTA ENERGIAE SOLARIS SINICA] in Chinese Vol 2 No 4, Oct 81 pp 353-362

TEXT OF ENGLISH ABSTRACT: The wind generating systems utilizing variable-speed constant-frequency systems can allow the rotational speed of wind turbine to vary with wind speed and operate at a constant and optimal tip speed ratio. Therefore, the wind turbines can maintain an optimal power coefficient over a wide range of wind speed and the complex and expensive speed regulating mechanism can be eliminated.

The field modulated generator system is a new variable-speed constant-frequency generating device. In this system, a specially designed three-phase high frequency alternator is excited by low frequency alternating current. The output, which is a modulated sine wave, is rectified, inverted and filtered to yield the constant

[Continuation of TAIYANGNENG XUEBAO Vol 2 No 4, Oct 81 pp 353-362]

frequency output independent of the prime-mover. This generator is specially suited for wind generating systems operated in parallel with the power grid. In this case, the excitation of the generator may be immediately obtained from the grid. The generator system synchronizes with the grid automatically. Therefore, the control and stabilization problems of the system can be greatly simplified.



(a) (b)

Variable-speed constant-frequency wind generating apparatus utilizing field modulated generators.

[Continuation of TAIYANGNENG XUEBAO Vol 2 No 4, Oct 81 pp 353-362]

This paper makes a comparison between constant-speed constant-frequency and variable-speed constant-frequency wind generating systems, describes the electric circuit and the principle of operation of the field modulated generator system, presents the operational and control aspects of a wind generating system utilizing this generator and experimental results of a 4 kW prototype coupled with a 6 meter Darrieus vertical axis wind turbine in a large wind tunnel.

9717
CSO: 4009/110

AUTHOR: ZENG Xingeng [2582 1823 5087]
ZENG Xianjiao [2582 2009 2403]
YANG Benjin [2799 2609 6930]
YE Xiaoying [5509 2556 5391]

ORG: ZENG Xingeng of the Panzhihua Comprehensive Geological Brigade, Sichuan Geological Bureau; ZENG Xianjiao, YANG and YE all of the No 403 Geological Brigade, Sichuan Geological Bureau

TITLE: "The Geological Characteristics and Mineralization Mechanism of the Stratiform Lead-Zinc Ore Deposits within the Zone of Lead-Zinc Deposits along the Eastern Flank of the Central Xikang-Yunnan Axis"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981 pp 420-426

TEXT OF ENGLISH ABSTRACT: The stratiform lead-zinc ore deposits at the eastern flank of the axis occur in the carbonate rocks of Upper Sinian, Lower Cambrian, Upper Ordovician and Middle Silurian. They are characterized by a consistent stratigraphic position, simple mineralogy and a similar assemblage of associated elements, and are invariably located in the semi-closed epicontinental basins with alternative sedimentation in large and small cycles.

The material source of the ore deposits is the mineralizing material-bearing weathering crust of the Presinian old land. Due to marine transgression, Pb and Zn were leached into water bodies. Under the influence of gyres of sea water, Pb and Zn elements migrated from the shallow area to the deep sea basin, and became increasingly concentrated with continuous halmyrolysis. During the late period of the Dengying (Sinian), as the crust rose, the climate changed, organisms died in large amounts, the H_2S content increased dramatically, the pH value in the sea water became high and the oxidation-reduction interface changed, ore-forming elements lost their balance and thus Pb and Zn sulfides were precipitated and concentrated in the relatively stable sea waters in the semi-closed sea basin.

[Continuation of DIZHI LUNPING Vol 27 No 5, 1981 pp 420-426]

AUTHOR: DENG Keqi [6772 0344 2630]

ORG: No 2 Surveying Designing Institute, Ministry of Railways

TITLE: "On the Phenomenon of CO_2 Natural Outflow in Baomashan, Central Yunnan"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981 pp 437-443

TEXT OF ENGLISH ABSTRACT: CO_2 gas with normal atmospheric temperature and high concentration has been found to flow out to the land surface in the central part of Yunnan Province. The pressure of the gas issuing at the land surface is low.

The source of the gas seeps is the sandstone layer in the upper part of the "central Yunnan redbed." Their localities are related to geological structural and geomorphological conditions: they are distributed on the gentle slopes and in the valleys where reservoirs or cultivated land are on the opposite sides of the watersheds.

The gas is stifling. For example, it may cause injuries and death when escaping in wells and pits, and insects die near gas holes.

In this paper, a model for CO_2 natural outflow process is proposed, the characteristics, mode and types of gas outflow are discussed, and changes in behavior of the gas during its outflow and the gas-water contact are elucidated.

AUTHOR: None

ORG: Institute of Geology, Chinese Academy of Geological Sciences

TITLE: "The Discovery of Alpine-type Diamond-bearing Ultrabasic Intrusions in Xizang (Tibet)"

SOURCE: Beijing DIZHI LUNPING [GEOLOGICAL REVIEW] in Chinese Vol 27 No 5, 1981 pp 455-457

TEXT OF ENGLISH ABSTRACT: Through the study of chromite deposits, diamond has been discovered in Xizang. According to the results of the field work as well as the petrological and petrochemical data, we confirm that these diamond-bearing ultrabasic masses belong to the Alpine-type. There are two masses. One occurs in northern Xizang and the other in southern Xizang. Both of them cover about 60-70 km^2. The ultrabasic rocks are composed mainly of harzburgite, peridotite and dunite. The grain size of the diamond ranges from 0.1 to 0.5 mm. Two grains of diamond were collected from harzburgite and dunite in the southern mass. Others were obtained from natural heavy fractions just around the northern mass.

9717
CSO: 4009/85

Internal Combustion Engine Engineering

AUTHOR: WANG Ruiqin [3769 3843 5367]
HOU Mingde [0186 2494 1795]
XU Chongzheng [1776 1504 2973]
JING Yonggang [5427 3057 0474]
ZHOU Shaojun [0719 1402 0193]
JIN Zhaonan [6855 2507 3948]

ORG: WANG, HOU, XU, JING and ZHOU all of Changchun Motor Vehicle Research Institute; JIN of Jilin University of Technology

TITLE: "The Influence of Constructional Parameters of Bathtub-type Chamber on Combustion Performance"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 1-9

TEXT OF ENGLISH ABSTRACT: The constructional features of the bathtub-type combustion chamber of the 6105 gas engine have been improved by increasing the combustion rate and the stability of the combustion process by means of enlarging the squish area, improving the compactness of the combustion chamber and changing the position of the spark plug. Remarkable effects have been obtained in easing the handicaps brought about due to excessive thermal load, higher exhaust temperature and greater noise emission of the original engine.

AUTHOR: CHEN Xinwen [7115 6082 5113]
HAO Shitian [6787 4258 1131]
MA Yunming [7456 0061 2494]
CHEN Wenkui [7115 2429 1145]
LU Jiaxiang [7120 1367 4382]
LI Peiting [2621 1014 0080]

ORG: CHEN Xinwen, HAO, MA and CHEN Wenkui all of the Shanghai Internal Combustion Engine Research Institute; LU of the Shandong Institute of Technology; LI of the Linshu Agricultural Machinery Works

TITLE: "A Report on the Design, Manufacture and Testing of a Backswept Bladed Centrifugal Compressor Impeller with Controlled Exit"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 10-18

TEXT OF ENGLISH ABSTRACT: In this paper, the design principle, manufacturing technology and testing results of a backswept bladed compressor impeller with controlled exit are described and analyzed. When compared with the ordinary radial bladed compressor impeller, its adiabatic efficiency increases by 4 percent, its effective flow range at rated speed widens by 11.4 percent, and its maximum efficiency zone enlarges by 42 percent.

[Continuation of NEIRANJI GONG CHENG No 3, 1981 pp 10-18]

The principle and boundary of surge of centrifugal compressor with certain vaneless diffusers are interpreted and predicted, and are confirmed as well by this experiment.

AUTHOR: YAN Xinben [0917 0207 2609]

ORG: Shanghai Diesel Engine Works

TITLE: "Investigation of the Turbocharged Diesel Engine Operated at High Altitude"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 19-28

TEXT OF ENGLISH ABSTRACT: Based on the bench test of the 6135 Q-1 turbocharged diesel engine at the altitude of 3810 meters in 1977, the running characteristics and adjustment approaches of that turbocharged diesel as well as its experimental results are reviewed. Other problems relating to any turbocharged engine operated at high altitudes are discussed at the same time.

AUTHOR: HE Wanxiang [0149 8001 4382]
WANG Shukui [3769 2885 1145]
HU Jianwei [5170 1696 0251]

ORG: HE and WANG both of Tianjin University; HU of Nankai University

TITLE: "A Study on the Dynamic Behavior of a Flying Ball Centrifugal Type Governor"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 29-41

TEXT OF ENGLISH ABSTRACT: This paper presents in detail the method of setting up a mathematical model for determining the dynamic behavior of the governor system in a generating set. The calculation is programmed according to the given model. A large number of calculations show that the calculating results are basically compatible with the measured values; therefore the accuracy of the mathematical model is confirmed, and the principal parameters which affect the dynamic behavior of the governor, the optimum values and permissible variation of some parameters are found out at the same time.

AUTHOR: WANG Changrong [3769 7022 2837]
XU Qifa [1776 6386 4099]

ORG: Both of the Shanghai Institute of Railway Technology

TITLE: "Testing and Analyzing Rubber Torsional Damper Used on Diesel Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 42-53

TEXT OF ENGLISH ABSTRACT: This article deals with the principle of decreasing torsional vibration by installing a rubber torsional damper in the crankshaft system of the diesel engine and offers the practical methods of measuring the basic characteristics of the damper.

By means of the static characteristic test with alternate loading, free damped oscillation test and dynamic damped characteristic test, the main performance parameters of the rubber torsional damper, such as natural frequency, dynamic stiffness, static stiffness, the ratio of dynamic to static stiffness and the ratio of dynamic damping coefficient, etc., can be measured, providing necessary material for calculating the torsional vibration of diesel engines as well as designing and employing the rubber torsional damper.

AUTHOR: YU Zheng [0151 6927]

ORG: Shanghai Marine Diesel Engine Research Institute

TITLE: "Derivations and Applied Analyses of the Theorems of Inertia Loads of Wobble Plate(s) on the Supports in Spatial Mechanism Wobble Plate Engines"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 54-64

TEXT OF ENGLISH ABSTRACT: For those wobble plate engines employing CSSRR* or other spatial mechanism, the inertia loads of the wobble plate(s) on the supports are the vital subjects in the dynamic analysis. The inertia load theorems of three types of rotational symmetric rigid wobble plates (i.e., static balance type, non-static balance type and the type used in the rotary cylinder unit engine) are derived and their practical meanings are also discussed. In addition, the inertia loads of the wobble plate in Model 8E 250 diesel engine are calculated and the related equations derived from existing wobble plate engines are listed for reference.

AUTHOR: LIU Yuzhao [0491 5940 2507]

ORG: Second Automobile Factory

TITLE: "The Running Smoothness of the Valve Gear in Model EQ 6100 Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 65-75

TEXT OF ENGLISH ABSTRACT: In this paper, a discussion is presented of the existing problems and approaches toward resolving them concerning the running smoothness of the valve gear in model EQ 6100 engine. This paper emphasizes the measurement of valve gear stiffness, calculation formulas of distributive probability of flexibility, and the main points toward increasing its stiffness, etc.

AUTHOR: YANG Yongping [2799 3057 1627]

ORG: Automobile Factory No 2

TITLE: "The Power Correction of Gas Engines--Discussion of the Power Rating of IC Engine"

SOURCE: Shanghai NEIRANJI GONG CHENG [CHINESE INTERNAL COMBUSTION ENGINE ENGINEERING] in Chinese No 3, 1981 pp 76-82

TEXT OF ENGLISH ABSTRACT: Based on the derivation and analysis of the power correction formula of a gas engine, the influences of mixture pre-heating and atmosphere temperature variation on the volumetric efficiency of different types of gas engines are discussed. The functions of the temperature index and mechanical efficiency in the formula must be taken into consideration.

9717
CSO: 4009/90

AUTHOR: FU Shimin [0265 0013 2404]
ZHANG Longxing [1728 7127 5281]
DU Yiju [2629 6654 5468]

ORG: All of Wuhan Institute of Iron and Steel Technology

TITLE: "Investigation of Gas-flow in Furnace Shaft"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 10-17

TEXT OF ENGLISH ABSTRACT: Based on the principle of fluid dynamics and model experiments in the laboratory, the authors of this paper have made investigations of gas flow in the non-irrigated zone of the furnace shaft. From the viewpoint of two-dimensional steady state flow, the authors describe the law of gas flow in the non-irrigated zone by mathematics. The fluid resistance was measured and calculated to the flow of several packed beds, for example, uniform, nonuniform beds and mixed burdens, horizontal and V-shaped layers, by different charging system. Additional resistance to the flow in the interfacial regions of coke and glass spheres was measured and described by theoretical analysis. A suggestion is presented to control optimal gas distribution by measuring the permeability index $(Q^2/\Delta P)$ at different parts of the furnace during operation.

AUTHOR: YANG Zhaoxiang [2799 0340 4382]
DUAN Zhenying [3008 2182 3467]

ORG: Both of Northeast Institute of Technology

TITLE: "An Investigation of Alkali Reduction Kinetics in the Blast Furnace Slag Containing Fluorine"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 18-25

TEXT OF ENGLISH ABSTRACT: In this paper, the alkali reduction kinetics in the blast furnace slag containing fluorine have been studied and the test program was planned by second degree regression orthogonal method. According to the test results, it is shown that increasing the slag basicity, slag temperature and content of CaF_2 in the slag may promote the reduction of alkali oxide. Based on the mathematical treatment of these results the regression equation has been given. It may be used to calculate the reaction rate constants for reduction of potassium oxide with different basicity, temperature and CaF_2 content of slag. Based on the data, it may be concluded that the reduction of alkali oxide in slag is the first order reaction and its reaction rate is controlled by the interface chemical reaction. For dealkalinization reaction, the apparent activation energy has been determined in the range of 35.9 - 122.8 kcal/mol and it is increasing with the decreasing basicity and CaF_2 content in slag. The reaction rate of potassium oxide is greater than that of sodium oxide by 8.8 times. The authors of this paper have suggested a rational formula to express the total alkali load in the

[Continuation of GANGTIE No 9, 1981 pp 18-25]

blast furnace. Through systematic analysis of the test results, a mathematical statistics model to calculate the circulating alkali store in the furnace has been established.

AUTHOR: NA Baokui [6719 1405 7608]

ORG: Central Iron and Steel Research Institute

TITLE: "On the Oxidation Behavior of Vanadium in Molten Iron Refined by Sodium Carbonate"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 26-32

TEXT OF ENGLISH ABSTRACT: In searching for an economical and rational process for recovery of vanadium from molten iron containing vanadium, the iron was treated with Na_2CO_3 flux. The effects of [Si] content, basicity of the slag, flux consumption, refining temperature and Fe_2O_3 addition were investigated. The experimental results led to the conclusion that Na_2CO_3 can effectively remove vanadium, silicon, phosphorus and sulfur, but has little effect on carbon. To obtain good results, it is necessary to keep Si content in the metal below 0.3 percent, basicity (Na_2O/SiO_2) above 4, flux consumption more than 30 g/kg·Fe and temperature as low as possible (preferably within 1300-1350°C). Addition of Fe_2O_3 to the flux will promote oxidation of vanadium. Under the condition of Na_2CO_3 consumption at 35 g/kg·Fe and temperature of 1300°C, a vanadium residual content of 0.03, a slag of 13.5 V_2O_5 and a 90 percent recovery of vanadium will be expected.

AUTHOR: LU Shaohai [4151 4801 3189]
HUANG Zhengqi [7806 2973 3825]
MA Gengqiu [7456 1649 4423]

ORG: All of Wuhan Iron and Steel Company

TITLE: "The Research on the Technology of Manufacturing the Work Roll for Sendzimir Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 33-39

TEXT OF ENGLISH ABSTRACT: This paper centers around the manufacturing technology of the work roll of Sendzimir 20-high mill, including the selection of the material, melting, heat treatment and cold working. This work roll is developed by the Co-containing material, medium-frequency induction hardening technique as well as by the cold working of the centering hole.

The work roll manufactured by the above-mentioned technology has many advantages, such as high strength with lath martensite structure, high resistance to cracking and lower consumption factor, etc.

This paper is intended to discuss the above problems with regard to theory and practical application.

AUTHOR: LI Lianshi [2621 6647 6108]

ORG: Beijing University of Iron and Steel Technology

TITLE: "Calculation of Rolling Load in Two-roller Skew Piercing Mill"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 40-43

TEXT OF ENGLISH ABSTRACT: This paper gives simple formulas for calculation of parameters related to rolling load: rolling force, guide force, axis force, mean specific pressure and contact area between rolls and metal in tube piercing mill. These formulas are obtained based on a great deal of experimental data measured.

A theoretical method for calculation of rolling torque is also discussed. This method facilitates technical calculation with sufficient accuracy.

AUTHOR: LI Pei [2621 8951]
LUO Jiqun [4382 4949 5028]
YU Hongxiang [0060 3163 7449]

ORG: All of Baotou Research Institute of Metallurgy

TITLE: "Causes for Life Increasing by Rare Earth Addition in a Fe-Cr-Al Heat-resistant Alloy"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 44-50

TEXT OF ENGLISH ABSTRACT: During rapid life test at 1350°C nodules of Fe-enriched oxides were formed in the oxide scale when the aluminum content in Fe-23Cr-6Al alloys decreased to the level of about 1 wt percent. Growth of these nodules generally led to rupture of the test wire. The expense of aluminum in the alloys was greatly slowed by addition of 0.15 wt percent La, 0.15 wt percent Ce or 0.60 wt percent Y, hence the test life of the alloys increased by 4-6 times.

On the α-Al_2O_3 scales of the alloys containing rare earth elements, no oxide ridges were found. Therefore, the scales were lightly adherent to the substrate and the oxidation rate of the alloys did not increase rapidly with the cyclic change of the temperature. No crack and nodules were found on ridge-free scales and the isothermal oxidation rate of alloys also decreased. In addition, the protective scales also prevented nitrogen in the air from penetrating into the alloys to

[Continuation of GANGTIE No 9, 1981 pp 44-50]

form AlN. All these factors made the expense of Al in the alloys containing rare earth elements slow down.

On high-temperature oxidation, rare earth elements usually formed internal oxides. Enrichment of rare earth elements in early oxide scales was found.

AUTHOR: CAO Yongjia [2580 0516 1367]
WANG Honghai [3769 3163 3189]
LUO Xiyu [5012 6932 5940]

ORG: All of the Central Iron and Steel Research Institute

TITLE: "Properties of P/M High Speed Steel"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 9, 1981 pp 51-57

TEXT OF ENGLISH ABSTRACT: The properties of P/M high speed steel W12Cr4V5Co5 (FT15) have been studied. Powder of this P/M steel was prepared by nitrogen atomization and solid materials were compacted by hot extrusion. Hot extrusion is beneficial to crushing the oxide layer on the surface of the powder particles, thus reducing the adverse effect of oxygen on the properties of the metal. The microstructure of the powder and characteristics of extruded bar are described. Based on the experimental results the parameters of heat treatment for this P/M steel were established. Their physical and mechanical properties were determined and the fracture surfaces were investigated. Wear resistance and cutting tests were performed in comparison with the conventional high speed steels.

9717
CSO: 4009/98

AUTHOR: ZHANG Peilin [1728 1014 2651]
ZHAO Shuoyan [6392 2592 1280]

ORG: Both of the Laboratory of Laser Physics, Qinghua University

TITLE: "Frequency Characteristics of Passive Cavity for Pulsed Dye Lasers"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 9, Sep 81 pp 1-6

TEXT OF ENGLISH ABSTRACT: A new method for calculating selected frequency and linewidth of a passive cavity for pulsed dye lasers is presented. Several typical cavities containing gratings, etalons and resonant reflector as frequency selective elements are studied. The influence of groove number of gratings and optical thickness of the resonant reflector upon linewidth are discussed. The theoretical values are in agreement with the experimental results.

AUTHOR: ZHU Dayong [2612 1129 0516]
ZHONG Lianji [0022 1670 1015]

ORG: Both of Chengdu Institute of Radio Engineering

TITLE: "Stark-effect Modulation of CO_2 Lasers with NH_2D"

SOURCE: Shanghai JIGUANG [LASER JOURNAL] in Chinese Vol 8 No 9, Sep 81 pp 7-10

TEXT OF ENGLISH ABSTRACT: The molecular Stark effect in NH_2D is used to modulate strong P (20) line at 10.6 μm of a CO_2 laser. A modulation depth of 41 percent is obtained from a 400 Hz 20 V rms sinusoidal modulation signal and a 440 V DC bias applied to a 20 cm gas cell outside the laser at a gas pressure of 5 torr. The maximum modulation depth of the gas cell is calculated as 42 percent, which is in good agreement with the experimental results. When sinusoidal modulation signal is 2 MHz 20 V rms, a modulation depth of 12 percent is achieved. NH_2D was prepared by mixing ND_3 and NH_3 and ND_3 was prepared by the present authors.

9717
CSO: 4009/104

AUTHOR: None

ORG: Shanghai Level Instrument Plant

TITLE: "The TS-1 Center-matching Projection Instrument"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 9, 20 Sep 81 p 13

ABSTRACT: The center-matching projection instrument may be installed in boring, milling, drilling, coordinate grinding machines, and the principal shaft hole of spark machining tool to aim accurately at the marked position or the coordinate point of the work piece to cause it to be aligned with the center of rotation of the major axis of the tool so as to improve machining precision of the tool. This paper is written as an advertisement for the projection instrument manufactured by the Shanghai Level Instrument Plant. Technical data, and the method of installing and using the instrument are briefly described.

AUTHOR: None

ORG: Shanghai Liantang Machine Tool Plant

TITLE: "The B60100 Shaping Machine"

SOURCE: Shanghai JIXIE ZHIZAO [MACHINERY] in Chinese No 9, 20 Sep 81 p 37, front cover

ABSTRACT: The Shanghai Liantang Machine Tool Plant was assigned as the factory to remodel the equipment of Shanghai Municipal Bureau of Machine and Electricity No 1. It has been manufacturing the B665-1 shaping machine for several years and has the specialized technical manpower and equipment. Its research on making the B60100 began last year and the successful resultant product has now been certified to have reached the ministry's quality standards. The plant has commenced to manufacture it in batches to supply the remodeling needs of the machine industry. The major technical specifications of the shaper are included in the paper. A photo of it is reproduced on the front cover of this issue of the journal.

6168
CSO: 4009/21

AUTHOR: ZHONG Wanxie [6945 8001 0533]

ORG: Research Institute of Engineering Mechanics, Dalian Institute of Technology

TITLE: "On the Application of Generalized Displacement in the Finite Element Method and Its Implementation"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 15-30

TEXT OF ENGLISH ABSTRACT: In this paper the application of generalized displacement in the selection of the structure analysis model in the finite element method is discussed, such as plate lattices, the master-slave relationship, the generalized displacement and structure symmetry, etc. In addition, the computer implementation method of the governing generalized displacement is discussed and the algorithm is briefly described by meta language expression.

AUTHOR: CHEN Huibo [7115 1920 3134]

ORG: Taiyuan Heavy Machinery Factory

TITLE: "Production Practice of Compound Curve Roll on Two-roll Cross Rolling Piercing Mill"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 47-52

TEXT OF ENGLISH ABSTRACT: The two-roll cross rolling piercing mill is widely used in hot rolling seamless tubes. In the past it was considered that the piercing involved "surface contact" between the barrel-shaped rolls and the piercing-rolled metals. However, this is not a scientific soncept. The author of this article has found that there is a disconnected contact curve on the contact surface. Thus, the conjugate contact drive is formed through the contact curve.

In putting forward the design theory of compound curve roll, the author adopts the linear contact concept in the article, and the production practices on the $\phi 76$ and $\phi 100$ two-roll cross rolling piercing mills have proved that the design and computation are correct. The article recommends the adoption of the compound curve roll in the design of all Mannesmann-type piercing mills, providing steady piercing and strengthening piercing conditions, thereby greatly increasing the productivity and improving shell quality.

AUTHOR: LIU Yu [0491 1342]

ORG: Harbin Electrical Wire Works

TITLE: "Analysis and Design of Pulse Control Temperature System"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 53-67

TEXT OF ENGLISH ABSTRACT: This article deals with three questions:
1. Use of the SCR units initiated only at zero phase in every period control temperature, thus escaping the interference of mains caused by initiating the shifting phase.
2. Introduction of the constancy principle to turn the system of nonlinear variable parameters into the linear stationary system, removing the interference on the systemic function caused by the main voltage variation.
3. It is both simple and accurate to obtain the two- or three-dimensional state equation and the output equation directly from the time response curve of the controlled object.

AUTHOR: CHEN Xichen [7115 3356 3819]
WANG Zulun [3769 4371 0178]
YI Sunsheng [2496 1327 5110]
et al.

ORG: All of the Institute of Physics, Chinese Academy of Sciences

TITLE: "The Investigations of the Modification Mechanism of Al-Si Alloys with the Addition of Sb"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 68-77

TEXT OF ENGLISH ABSTRACT: At present there are different points of view on the modification role of Sb in Al-Si alloys. This paper describes the effect of adding Sb to the crystalline process, and topography of eutectic Si and the trail of Sb are studied in this paper. A comparison is also made with adding Na. The results show that the eutectic state changes after adding Sb and an AlSb compound appears in the Si phases. The role of Sb is to separate dispersed crystals of AlSb from the melt and these dispersed crystals are the heterogeneous nucleus of Si.

AUTHOR: ZOU Zixiang [6760 3320 4382]

ORG: Institute of Engineering Thermophysics, Chinese Academy of Sciences

TITLE: "The Principles and Methods of Aerodynamic Design of a Seriation Axial Turbine and Its Tests"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 78-89

TEXT OF ENGLISH ABSTRACT: In this paper, a technical line of designing the seriation turbochargers CZ and the characteristics, principles and methods of designing a seriation axial turbine are described. In addition, some test data of the turbine stage efficiency are presented.

AUTHOR: ZHANG Hong [1728 3163]

ORG: Beijing Institute of Aeronautics and Astronautics

TITLE: "Influence of Diamond Form upon Dressing Accuracy of Form Grinding Wheel and Its Elimination"

SOURCE: Beijing JIXIE GONGCHENG XUEBAO [CHINESE JOURNAL OF MECHANICAL ENGINEERING] in Chinese Vol 17 No 3, 1981 pp 90-96

TEXT OF ENGLISH ABSTRACT: The form of the diamond used for dressing the form grinding wheel has an unnegligible influence upon the dressing accuracy. The following measures may be adopted individually or simultaneously to improve the dressing accuracy:
1) Decrease the form error of the diamond, such as choose a sharper diamond or sharpen it in case it is dull, polish the diamond into exact radius, etc.;
2) Decrease the dressing pressure angle γ_D of the dressing mechanism;
3) Grind the stylus of the dressing mechanism in accordance with the form of the diamond.

9717
CSO: 4009/74

AUTHOR: ZHANG Xianglin [1728 4161 2651]

ORG: The 3403 Factory

TITLE: "Effects of Carbides on the Mechanical Property of Steel"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 10, 25 Oct 81 pp 15-23

ABSTRACT: The shape, size, and distribution of carbides form the major microstructural parameters of steel. Diffusion of carbides is the important strengthening mechanism and also influences the toughening of steel. This paper emphasizes the effects of carbides on strengthening and thoughening and the mechanical property of steel. Thermodynamic and kinetic characteristics of carbide diffusion and factors affecting carbides are also introduced.

AUTHOR: CHEN Fufu [7115 4395 4395]

ORG: Shanghai Jiangnan Shipbuilding Plant

TITLE: "Pollution-free Electolytic Carburization"

SOURCE: Beijing JINSHU RECHULI [HEAT TREATMENT OF METALS] in Chinese No 10, 25 Oct 81 pp 26-29

ABSTRACT: This paper introduces in detail the carburization mechanism and required equipment for electrolytic carburization. **Experiments** to test the relationship between the current density and surface carbon concentration, the relationship of density distribution of the test specimen, the relationship of the depth of the carburization layer and the electrolytic carburization work procedure, and the structural characteristics of the electrolytic carburized layer are reported. Actual preliminary applications of the technique are also described.

6168
CSO: 4009/120

AUTHOR: ZHANG Shunquan [1728 5293 3123]

ORG: None

TITLE: "An Analysis of Design Principle of Electronic System of Short Dead Zone Ultrasonic Thickness Gauge Model CSHCH-3"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This is a new approach to design of a short dead zone ultrasonic thickness gauge, utilizing a mathematical model of the electronic automatic control system. The tail of the first echo pulse from the boundary of the delay block will be cleared by means of the compensation regulator with electronic network. It is practical to shorten the dead zone to 0.3 mm for steel at 5 MHz and 0.2 mm at 10 MHz.

AUTHOR: CHEN Yuwen [7115 5148 2429]
JI Bu [1323 2975]

ORG: Both of Shanxi Metal Structure Plant

TITLE: "Ultrasonic Inspection of T-shape Fillet Welds"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 8-15

TEXT OF ENGLISH ABSTRACT: The authors introduce the method of ultrasonic inspection of partial-penetration and full-penetration T-shape fillet welds. Transverse wave testing from wing is adopted for the former and both transverse and longitudinal wave testing are used for the latter.

AUTHOR: ZHOU Jiaguang [0719 1367 0342]
ZHENG Yufang [6774 3768 5364]
GUO Yanyi [6753 3348 0308]

ORG: All of the Shanghai Institute of Ceramics, Chinese Academy of Sciences

TITLE: "Characteristic Analysis of Lithium-Sodium Niobate Ceramic for Ultrasonic Transducers"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 16-19

TEXT OF ENGLISH ABSTRACT: In this paper, the dielectric and piezoelectric properties of a modified lithium-sodium niobate (LNN) piezoelectric ceramic are described and analyzed. For the sake of comparison, the properties of some ceramic compositions which are in ordinary use are presented. The modified LNN ceramic has a proper coupling value and very low dielectric constant. The important characteristic is that the LNN ceramic has very high frequency constant of about 3250 Hz·m and low density of about 4.49 g/cm^3. All these properties are available for high frequency ultrasonic probes used for thickness measurement and nondestructive testing. The practical application shows that the LNN ceramic is a good material for ultrasonic transducers of high frequency with high damping, high resolution and less dead zone.

AUTHOR: SONG Shulin [1345 2579 2651]

ORG: Taiyuan Heavy Machinery Plant

TITLE: "Mode Transformation of Ultrasound on Heterogeneous Boundary and Determination of Crack Height"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 20-23

TEXT OF ENGLISH ABSTRACT: During ultrasonic testing, the size and location of defects are determined according to the amplitude and position of echoes on the screen. Spurious defect echoes and edge peak-wave of a defect often appear in practical testing because of the mode transformation on heterogeneous boundary. This article discusses the cause and conditions under which the spurious echoes will occur and their identification method. It also describes the application of edge wave to determine the size of plane defect.

AUTHOR: ZHENG Shicai [6774 0013 2088]

ORG: Xinli Machine Plant

TITLE: "Simple Mathematical Analysis of the Method for Locating Flaws with Thin Test Plate"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 24-25

TEXT OF ENGLISH ABSTRACT: In this paper a mathematical analysis is given of the method for locating flaws with the thin test plate used in weld inspection. It is shown that the horizontal 1:1 adjustment is actually to make the slope of a straight line T=Kal+Kb equal to 1. The method for locating flaws is discussed.

AUTHOR: SUN Shuqing [1327 2885 7230]

ORG: Shaoguan Cast Forge Factory, Guangdong

TITLE: "Discussion of Defect Size Determination in Ultrasonic Longitudinal Wave Testing by 6 dB Drop of Back Reflection"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 26-27

TEXT OF ENGLISH ABSTRACT: This paper briefly analyzes the problems existing in ultrasonic measurement of large defects by the conventional half-amplitude method. However, the use of 6 dB drop of back reflection method for size determination of large defects is also investigated and discussed, and the preliminary test results show that this method is feasible.

AUTHOR: LING Jianchu [5677 1696 0443]
CAO Kuijun [2580 1145 0689]

ORG: Both of Liyang Machinery Plant

TITLE: "Nondestructive Testing of Discs Made of Titanium Alloys"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 28-30

TEXT OF ENGLISH ABSTRACT: This paper briefly describes and analyzes the metallurgical defects in disc-like products made of titanium alloys, and also the proper nondestructive testing method that should be chosen according to the characteristics of the alloys.

AUTHOR: JIANG Tinglu [1203 1694 4389]

ORG: Harbin Boiler Works

TITLE: "Application of Acoustic Emission Technique to the Inspection in Welding Process"

SOURCE: Shanghai WUSUN JIANCE [NONDESTRUCTIVE TESTING] in Chinese No 4, 1981 pp 31-35

TEXT OF ENGLISH ABSTRACT: This paper illustrates the principle of acoustic emission applied in welding inspection and the source of interference noise. Some practical examples are given and their characteristics are discussed. Also discussed are main problems in application.

9717
CSO: 4009/72

AUTHOR: PAN Haochang [3382 3185 2490]
WEI Shijun [7614 0013 0193]

ORG: Both of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "Optical Crosstalk Discrimination of Liquid Scintillation Counter"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 15-20

TEXT OF ENGLISH ABSTRACT: The crosstalk spectra of a liquid scintillation counter were analyzed and investigated in this paper. We have manufactured a crosstalk discriminator. By using the discriminator in the liquid scintillation counter, the background of measuring ^{14}C was decreased from 3.499 ± 0.059 cpm to 2.222 ± 0.027 cpm; the merit was increased from 1820 to 2738; the efficiency continued to reach 78.0 percent; the empty bottle count was decreased from 4.560 ± 0.0675 cpm to 1.156 ± 0.034 cpm.

AUTHOR: ZHANG Guangming [1728 0342 2494]
ZHAO Deyao [6392 1795 5069]
ZHOU Weizhen [0719 5633 4176]

ORG: All of the Shanghai Institute of Nuclear Research, Chinese Academy of Sciences

TITLE: "Mercuric Iodide Nuclear Radiation Semiconductor Detector"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 26-28

TEXT OF ENGLISH ABSTRACT: After the crystals are cleft into plates, they are etched in a 5~10 percent KI-water solution to eliminate the damages in the cleft surfaces. The etched crystal plates are contacted with "Aquadag" and palladium wires are attached to the contact with carbon paint. Such a detector is encapsulated in a teflon support. Using a HgI_2 detector with active surface of 8 mm^2 and thickness of about 200 μm, a bias of 600 V, at a temperature of 283°K, with pulse shaping time being 3.2 μs and for an uncollimated source, it is shown that the energy resolution (FWHM) of the detector is 1.4 keV for 5.9 keV of ^{55}Fe, 1.7 keV for 22 keV of ^{109}Cd and 3.62 keV for 59.5 keV of ^{241}Am respectively. The linewidth of the electronics is 1.1 keV.

AUTHOR: WEI Baowen [2607 1405 2429]
LUO Shiyu [5012 6108 5940]

ORG: Both of the Institute of Modern Physics, Chinese Academy of Sciences

TITLE: "Stationary Orbit Properties of a Four-fold Symmetrical Radial Sector Cyclotron"

SOURCE: Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 5, Oct 81 pp 47-49

TEXT OF ENGLISH ABSTRACT: A particle motion equation has been derived on a four-fold symmetrical radial sector cyclotron and the stationary orbit properties were analyzed numerically for a $2\alpha=52°$ machine. The results showed that the particle motion is relatively stable when the particle energy is less than 100 MeV/A.

9717
CSO: 4009/10

AUTHOR: NING Feizhang [1380 2431 4545]
YU Fengchi [0060 7685 3069]

ORG: Both of Harbin Research Institute of Welding

TITLE: "The Small Impulse Holes in Electron Beam Weld on Sheet Metal"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 2, Jun 81 pp 47-54

TEXT OF ENGLISH ABSTRACT: The characteristics of small impulse holes in electron beam weld on sheet metal are described. A "high speed fusion" photographic method, by which the cause of formation of the holes was ascertained, facilitated the visual observation of the filament emission and behavior of the beam. The authors found that the small holes were induced by and closely related to the impulsive emission from the filament, which was heated directly with industrial AC power source. The appropriate ways and means to suppress the small impulse holes are suggested in this paper. Bimetal machine saw blades have been welded successfully without impulse hole by electron beam with intensive welding parameters. The welding process is stable; the weld is good in quality. By positioning the seam adjacent to the root of the saw tooth, we may obtain not only a 95 percent saving of high speed steel, but also a prolonged blade life plus better cutting performance.

AUTHOR: MEI Fuxin [2734 4395 2946]
WU Yuehua [0124 2588 5478]
LU Guiquan [4151 2710 0356]

ORG: All of the South China Institute of Technology

TITLE: "On the Study of Underwater Cutting Using Water Jet Technique"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 2, Jun 81 pp 55-62

TEXT OF ENGLISH ABSTRACT: This paper describes the experimental results of underwater cutting for low-carbon steel of thickness $\delta = 8\sim23$ mm. Consumable electrode and tungsten electrode water jet techniques are used under analogous conditions in a freshwater tank.

It might be concluded that underwater cutting with the water jet technique for low-carbon steel under normal conditions always results in clear cuts with lower cost and higher cutting efficiency than other underwater cutting methods. Being simple and handy, the tungsten method in particular suits best underwater cutting.

AUTHOR: LI Runmin [2621 3387 3046]
TIAN Wanyu [3944 8001 6877]
LU Huangong [7120 3562 0501]
et al.

ORG: All of Harbin Research Institute of Welding

TITLE: "Cracks Formed in the Heat Affected Zone in Thick-walled Vessels Fabricated with 14Cr2Ni4MoV Steel and Their Effects on Construction Safety"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 2, Jun 81 pp 63-74

TEXT OF ENGLISH ABSTRACT: This paper aims at investigating the properties of welded joints of thick-walled pressure vessels fabricated with 14Cr2Ni4MoV low-alloy high strength steel. It is believed that there were liquation cracks and high temperature low-ductility cracks in the weld heat-affected zone adjacent to the fusion line. The said cracks, under certain conditions, could induce delay cracks. Mechanical tests showed that this region was the weakest in the welded joint, and was the short life region.

AUTHOR: ZHANG Xiangquan [1728 4161 2938]
CHEN Zexin [7115 3419 3512]
ZHOU Guangqi [0719 0342 4388]
et al.

ORG: All of Xi'an Jiaotong University

TITLE: "A Study of Reheat Cracking with the Implant Method--Assessing the Reheat Cracking Susceptibility of 14MnMoNbB, BHW38 and 15MnVNCu Pressure Vessel Steels"

SOURCE: Harbin HANJIE XUEBAO [TRANSACTIONS OF THE CHINA WELDING INSTITUTION] in Chinese No 2, Jun 81 pp 75-84

TEXT OF ENGLISH ABSTRACT: In this paper an implant reheat cracking test by stress relaxation was introduced and a comparison of the reheat cracking susceptibility of three pressure vessel steels, namely 14MnMoNbB, BHW38 and 15MnVNCu, was made. The study of susceptibility was based on two rupture criteria: the minimum initial critical stress and the minimum rupture time shown on the "C"-shaped curve of reheat cracking. The test results revealed that the coarse-grained overheated region of 14MnMoNbB steel was more susceptible to reheat embrittlement than was that of BHW38 steel, while 15MnVNCu steel, being practically free from reheat cracking, was the one least susceptible.

9717
CSO: 4009/107

END

JPRS 79601

7 December 1981

China Report

SCIENCE AND TECHNOLOGY

No. 139

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79601

7 December 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 139

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Article Describes Artificial Satellite Laser Rangefinder (Tan Detong; WUXIANDIAN, No 8, 1981) 1

ABSTRACTS

AGRICULTURE RESEARCH

HUBEI NONGYE KEXUE /HUBEI AGRICULTURAL SCIENCES/ No 10, Sep 81 ... 2

CHEMISTRY TECHNOLOGY

RANLIAO HUAXUE XUEBAO /JOURNAL OF FUEL CHEMISTRY AND TECHNOLOGY/ No 3, Sep 81 5

COAL TECHNOLOGY

MEITAN KEXUE JISHU /COAL SCIENCE AND TECHNOLOGY/ No 10, 25 Sep 81.. 6

CONSTRUCTION MACHINERY

GONGCHENG JIXIE /CONSTRUCTION MACHINERY AND EQUIPMENT/ No 10, 20 Oct 81 7

GONGCHENG JIXIE /CONSTRUCTION MACHINERY AND EQUIPMENT/ No 9, 20 Sep 81 9

ELECTRONICS

DIANZI XUEBAO /ACTA ELECTRONICA SINICA/ No 5, 1981 11

[III - CC - 84]

DIANZI KEXUE JISHU /SCIENCE AND TECHNLLOGY OF ELECTRONICS7 No 10, 10 Oct 81 21

ENGINEERING

NANJING GONGXUEYUAN XUEBAO /JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY7 No 3, 1981 22

DONGBEI GONGXUEYUAN XUEBAO /JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY7 No 3, 1981 29

INSTRUMENTATION TECHNOLOGY

YIQI YU WEILAI/INSTRUMENTATION AND FUTURE7 No 9, Sep 81 41

PRINTING TECHONOLOGY

YINSHUA JISHU /PRINTING TECHNOLOGY7 No 5, 1981 43

PROSPECTING TECHNOLOGY

TANKUANG GONGCHENG /PROSPECTING TECHNOLOGY7 No 5, 20 Oct 81 45

TELECOMMUNICATIONS

DIANXIN KUAIBAO /TELECOMMUNICATIONS INFORMATION7 No 7, Jul 81 46

WATER CONSERVATION

SHUILI SHUIDIAN JISHU /WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY7 No 9, 20 Sep 81 47

SHUILI SHIDIAN JISHU /WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY7 No 10, 20 Oct 81 49

WATER POWER

SHUILI FADIAN /WATER POWER7 No 5, 12 May 81 53

APPLIED SCIENCES

ARTICLE DESCRIBES ARTIFICIAL SATELLITE LASER RANGEFINDER

Beijing WUXIANDIAN [RADIO] in Chinese No 8, 81 p 14

[Article by Tan Detong [6223 1795 0681]: "Artificial Satellite Laser Rangefinder"]

[Text] Artificial satellite laser rangefinding is a new technique in the study of variations in the earth's self-rotation, movements of earth's poles, shape of the earth, the earth's gravitational field and continental drift. It is of significant importance in astronomical geodynamics, geodetic survey and seismic studies.

The heart of the rangefinder is a laser. It produces a sequence of extremely narrow pulsewidth high intensity laser pulses aimed at the artificial satellite in orbit through a telescope, the signals reflected from the satellite back to earth are detected by a receiving telescope. Using a high resolution counter to record the time difference τ between the transmitted and received pulses, distance of the satellite R can be found using the formulae $R = 1/2\ c\tau$.

A modern rangefinder is an integrated precision instrument involving optics, mechanics and electricity. It is equipped with a computer so that the entire measurement process is automated. Based on forecast of the satellite flight orbit, the computer directs the telescope to focus on the target; once the telescope has tracked the satellite, the computer then commands the transmission of the laser pulses. The measured results are first judged by the computer for authenticity and then stored in data memory. If the target is lost in the process of observation, the computer immediately conducts an automatic search scanning procedure until the rangefinder is reaimed.

The cover photo shows a first generation artificial satellite laser rangefinder developed jointly by Shanghai Astronomical Observatory and Shanghai Institute of Optics and Fine Mechanics. The apparatus is installed at the Yushan Station of Shanghai Astronomical Observatory. In recent years, artificial satellite laser rangefinders have been installed in Beijing, Kunming, Zhengzhou, Xi'an, and Guangzhou to form a preliminary observation network. They are currently carrying out scientific research observations and participating in international cooperation projects and have obtained good results.

9698
CSO: 4008/15

AUTHOR: XIE Weiyue [6200 4850 1971]

ORG: Xiangyang Prefecture Research Institute of Agricultural Sciences

TITLE: "Preliminary Investigation Into Factors Influencing the Grain Weight of Wheat"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese No 10, Oct 81 pp 1-4

ABSTRACT: Under the condition of 300 thousand spikes/mu and 35 grains/spike on the average, the increase of every one g of the grain test weight [per 1000 grains] means a yield increase of 21 jin of wheat/mu. The effects of the weather. and cultivation conditions (including planting time, density, and fertilizer application) on the weight of the grains are examined in detail based upon the experimental data of the institute, 1955-76, using current breeds of wheat, such as Nanda-2419, Xiang mo No 4, Yibing No 1, Omo No 6, etc. Results indicate that aside from various natural factors after inflorescence, the weight of grains is also greatly affected by the cultivation and management conditions throughout the growth and development period of the wheat. Accordingly, measures concerning timely planting, reasonable density, lodging prevention, additional fertilizer application, flood and drought prevention, disease and pest prevention and control, and timely harvest and threshing that are favorable for increasing the dry weight of the grains are proposed.

AUTHOR: XUAN Xiuzhi [6513 4423 5347]

ORG: Geothermal Experimental Station, Yingshan County

TITLE: "Physiological Characteristics and Cultivation Technique of Paddy Rice of Geothermal Greenhouse"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese No 10, Oct 81 pp 8-12

ABSTRACT: Since 1971, the author and colleagues have carried out 9 winter-spring seasons of repeated experiments with the use of geothermal greenhouse to cultivate paddy rice. The greenhouse is used to adjust the blooming time of early, intermediate, and late rice breeds freely to expand the range of selection of parents for hybridization. In 1972-76, more than 200 groupings were tried and 3 generations of propagation were successfully carried out in one year. Under the short daylight condition in the winter, the rice breeds have shorter period of growth and development and require less effective accumulation of temperature when they are cultivated in the greenhouse. When spring water containing sodium sulfate is used to water the rice plants in the greenhouse for a prolonged period of time and the soil pH reaches 8-9, the seedlings will be harmed and the only way to overcome the problem is to replace the soil and not to use the spring water. Various other important techniques of greenhouse culture of paddy rice are discussed. There is no mention of the source of the heat energy or the structure of the greenhouse, however.

AUTHOR: ZHU Qisheng [4376 0366 0524]

ORG: Soil and Fertilizer Center, Hubei Provincial Academy of Agricultural Sciences

TITLE: "Preliminary Research on the Fertility Supplying Capacity of the Soil of Huangnitian and the Effect of Fertilizer Application"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese No 10, Oct 81 pp 16-18

ABSTRACT: Huangnitu [soil of Huangnitian, a field of yellow mud] is one of the major cultivated soils in Hubei, amounting to 20 percent of cultivated area of the province, i.e. about 12,808 thousand mu. Of these, 4,360 thousand mu are paddies and 8,448 thousand mu are dry fields, amounting to 14.7 and 24.5 percent of the province's paddies and dry fields respectively. The regions of its extensive distribution are also important production bases of grain, cotton, and oil of the province. At present, the yield of Huangnitu is generally not high, with unit yield of only 300-400 jin/mu of rice, or 100-200 jin/mu of wheat, or several tens of jin/mu of ginned cotton. A study, combining small-plot field experiment and laboratory analyses, has been conducted since 1979. The test crops are dual-season rice-green manure. The field experiment is divided into 6 forms: (1) control, with no fertilizer application; (2) basic fertilizer of 2500 jin green manure/mu; (3) basic fertilizer + nitrogen, i.e. (2) + 12 jin/mu of N; (4) basic fertilizer + nitrogen-phosphorus, i.e. (3) + 6 jin of P_2O_5/mu; (5) basic fertilizer + nitrogen-potassium, i.e. (2) + 12 jin of K_2O/mu; (6) basic fertilizer + nitrogen-phosphorus-potassium, i.e. (5) + 6 jin of P_2O_5/mu. Organic matter, pH, nitrogen, phosporus, and potas-

[continuation of HUBEI NONGYE KEXUE No 10, 1981 pp 16-18]

sium contents of Huangnitu specimens are analyzed before the experiment and after the harvest of the experimental crop every season. Rice plants are analyzed to compute the rate of absorption of nitrogen, phosphorus, potassium, and the fertilizer utilization rate. The fertilizer application benefit is further examined by combining the laboratory analysis results and growth condition and the yield of rice in the field. Results indicate that the productivity of Huangnitu is rather low and the yield of rice depends mainly on fertilizer. Utilization of chemical nitrogen is 46.1 percent for early rice and 60.6 percent for late rice. With added phosphorus, the rate is raised to 60.6 percent for early rice but only 61.3 percent for late rice. At present, potassium fertilizer has not demonstrated any yield increase results. Application of green manure appears to be the low cost and highly beneficial measure for yield increase in Huangnitu. Details of the experiment are reported.

AUTHOR: YIN Huadian [1438 0553 0368]
LI Yingxiang [2621 4481 3276]
WANG Guofan [3769 0948 5400]
ZHANG Gengxin [1728 5087 1800]
LEI Jianbao [7191 0256 0202]
LIAO Rencai [1675 0088 1752]
TAO Jun [7118 6874]

ORG: YIN, LI, WANG of Zhumadian Prefecture Veterinary Hospital, Henan Province; ZHANG, LEI of Huazhong College of Agriculture; LIAO, TAO of Hengyang Branch, Hunan College of Agriculture

TITLE: "Diagnosis of Rabies of Domestic Animals in Zhumadian Prefecture of Henan Province"

SOURCE: Huanggang HUBEI NONGYE KEXUE [HUBEI AGRICULTURAL SCIENCES] in Chinese No 10, Oct 81 pp 32-34

ABSTRACT: Since the autumn of 1980, cases of suspected rabies have been continuously discovered among domestic animals in Zhumadian Prefecture. In all cases, treatment produced no effect and the animals died. According to incomplete statistics of several animal hospitals, in Jan-May this year, 16 oxen, 8 sheep, 3 pigs, 1 donkey, 2 mules, and 2 dogs died of the disease in the prefecture. Epidemiological surveys, clinical symptoms, animal experimental inoculations, and laboratory examination of brain tissues all verify the diagnosis of rabies to be correct.

6248
CSO: 4009/113

AUTHOR: PENG Shaoyi [1756 1421 6654]

ORG: Shanxi Research Institute of Coal Chemistry, Chinese Academy of Sciences

TITLE: "Progress of Research on Fibrous Materials as Catalyst Carrier"

SOURCE: Taiyuan RANLIAO HUAXUE XUEBAO [JOURNAL OF FUEL CHEMISTRY AND TECHNOLOGY] in Chinese Vol 9 No 3, Sep 81 pp 193-205

ABSTRACT: More than 80 percent of work processes in petroleum, natural gas, and petroleum refining industries are related to catalysis and the conversion of coal energy and the utilization of solar energy are also dependent on catalytic reactions. Inorganic fibers, including carbon, glass, and aluminum oxide fibers, having a different surface structure and transfer characteristics, are among the newly developed catalytic carriers. Their greater surface area and much smaller pore diameter, relative to ordinary granular carriers,are favorable for diffusion control and fast surface reaction. Techniques of preparing and applying fibrous catalytic agents are introduced. Results of experiments, including those in related Western and Chinese literatures and experiments conducted by the author and colleagues, have proved these properties to be superior. Many basic problems, such as possible effects of their chemical composition and their micropores on the catalytic reaction, will require a great deal of research in the future, however.

AUTHOR: LU Guanghui [4151 0342 1920]
XU Genhui [6079 2704 1979]
LIU Guangyong [0491 0342 3057]
ZHANG Fuzhi [1728 4395 5347]
ZHAO Fulong [6392 4395 7893]
ZHANG Haojiang [1728 1170 6199]
CAI Zhonghe [5591 0112 9447]

ORG: All of Department of Chemical Engineering, Tianjin University

TITLE: "Study of Natural Mordenite Catalyst for Disproportionation of Toluene"

SOURCE: Taiyuan RANLIAO HUAXUE XUEBAO [JOURNAL OF FUEL CHEMISTRY AND TECHNOLOGY] in Chinese Vol 9 No 3, Sep 81 pp 206-215

ABSTRACT: This paper reports a study on the use of natural mordenite produced in Jinyun County of Zhejiang Province to prepare a catalyst for disproportionating toluene. Results indicate that the size of grain of the mordenite, the metallic element of the additive, and the method of preparation all have obvious effects on the stability of the disproportionating activity of the catalyst. The disproportionating property of the catalyst prepared with the natural mordenite with nickel and bismuth added is found to reach the level of that of synthetic mordenite catalyst.

6248
CSO: 4009/97

AUTHOR: HU Ruihua [2083 3843 5478]

ORG: Pingzhuang Bureau of Mines

TITLE: "Drainage by Drifts in Open-cast Mine of West Pingzhuang"

SOURCE: Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 10, 25 Oct 81 pp 13-15

ABSTRACT: The Pingzhuang West open-cast mine was constructed in 1958 and since 1965, its annual raw coal production has been 1.5 million tons. It is estimated to have 73 years of service. The hydrogeology of the region is rather complex, with the basin in the north, the mountain in the northwest, and a basaltic hilly topography overlying the coal seams. The seasonal Haernao River flows through the northern end of the opencut area. According to pumping data of the east side, the infiltration coefficient is 160.8 m/24 hours and the unit surge is 4.23 l/sec.m. In order to protect the stability of the side walls it was necessary to prevent the underground runoff below the river bed from seeping into the open-pit. Drifts were therefore placed 50 m to the north of the pit at a height of +515m. All through the 15 years since the construction of the drainage drifts, the water has always been timely drained to the ground surface for the use of surface industries. A design review and inspection in 1980 found all conditions to be normal. The drainage drifts are expected to be serviceable for the life of the mine. The horizontal arrangement of the drifts, the hydrogeological profile of the mining area, and the design calculations are introduced.

AUTHOR: QIN Wande [4440 8001 1795]

ORG: Bureau of Comprehensive Utilization, Ministry of Coal

TITLE: "Utilization of Gangue"

SOURCE: Beijing MEITAN KEXUE JISHU [COAL SCIENCE AND TECHNOLOGY] in Chinese No 10, 25 Oct 81 p 16

ABSTRACT: In China's mining regions, piles of gangue or spoil have already reached more than one billion tons. At 20 percent of the coal mined in the country, 100 million tons of gangue will be produced every year while at present only one hundred thousand tons of these are being utilized. It is, therefore, certain that these piles will be continuously enlarged in the future. The paper proposes: (1) to reclaim coal and pyrite from the gangue; (2) to generate electric power with the gangue; (3) to make bricks with the gangue; (4) to use the gangue as the raw material for cement; (5) to use the gangue as light aggregates for concrete; (6) to extract from the gangue chemicals for industrial use. Based upon the different characteristics of the gangue, it may also be used to improve soils, to make road beds, to serve as fill-dirt for various construction projects. Techniques of each of these usages of gangue are briefly introduced.

6168
CSO: 4009/108

AUTHOR: ZHANG Jizhen [1728 7162 3791]

ORG: None

TITLE: "The DZ1 Hole Drilling Vehicle"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 4-7

ABSTRACT: The DZ1 hole drilling vehicle is a special machine used for constructing electrified railways. It is an experimental design made jointly by Baoji Construction Machinery Plant of the Ministry of Railways and the Bureau of Electrification Construction. Its properties were tested in 1980 on the special railway line of the plant and on the Longhai Railroad. The machine is used to drill holes for power line poles. Mechanical transmission is used for motion and hydraulic transmission is used for operation. Its major technical parameters and the structural theories of its various components are explained. There is a photo depicting the hole drilling vehicle at work along the Longhai Railroad.

AUTHOR: GONG Bin [7895 2430]

ORG: Technology Division, Wuhan Truck Crane Plant

TITLE: "The YD5 Hydraulic Truck Crane"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 8-9

ABSTRACT: The YD5 hydraulic truck crane is designed by the Wuhan Truck Crane Plant as an economical equipment for both hoisting and transportation. The major technical parameters and structural characteristics are explained. It is suggested that under the condition of guaranteeing the hoisting capacity, the size and the weight of the entire system may be somewhat reduced, the CM-F40C-FL gear motor used in the truck has a relatively short useful life and a new one should be selected, and the oil tube of the hydraulic system is difficult to put together or take apart. There is no indication whether it is the author or some other organization who are making these suggestions. A photo of the YD5 hydraulic truck crane is included.

AUTHOR: FENG Likang [7458 4539 1660]
WU Weihao [0702 0251 6275]
ZHU Xiaoshi [2612 1420 1102]
CHEN Guoguang [7115 0948 0342]

ORG: All of Xiangshan Shipbuilding Plant

TITLE: "The JZ190 Conical Reverse Material Discharge Mixer Briefly Introduced"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 9-10

ABSTRACT: The JZ190 conical reverse material discharge mixer is an experimental product of the Xiangshan Shipbuilding Plant. It can be used to stir up both highly fluid or semi-dry concrete. When it revolves in the normal direction it stirs up the material and when it is operated in the reverse direction it discharges the material. The major property parameters and structural characteristics are explained. There are photos depicting the concrete mixer, the electrical contol box, and the water meter control valve.

AUTHOR: LIN Shuqin [2651 2885 0615]
HE Changji [0149 2490 4949]

ORG: Both of Chengdu Construction Machinery Plant; Tianjin Research Institute of Construction Machinery

TITLE: "The ZL20A and ZL30A Loaders"

SOURCE: Tianjin GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 10, 20 Oct 81 pp 10-12

ABSTRACT: On the foundation of the ZL20 and ZL30 loaders which the Chengdu Construction Machinery Plant has been producing in batches for many years, the plant absorbed opinions of the users and advanced experiences of foreign countries to improve these models. Very strict tests and experiments were carried out on all the major parts. Finally, the ZL20A and the ZL30A were successfully produced. In power readiness, property parameters, strength of structure, operating safety, and ease of maintenance and repair, the new models are a great improvement over the old ones. The structures of major parts and the power transmission theory were explained in two previous papers (GONGCHENG JIXIE No 4, 78 and No 4, 79) and are not repeated in this paper. There is, however, a table comparing the property parameters of the two new and the two old models.

6168
CSO: 4009/115

AUTHOR: WANG Mingquan [3769 0730 5425]
ZHAO Ying [6392 3841]

ORG: Both of Tianjin Research Institute of Construction Machinery, First Ministry of Machine Building; Yichun Construction Machinery Plant

TITLE: "Internal Combustion Trackless Tractor for Use in Mine Pits"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 1-5

ABSTRACT: In order to make trackless mines a reality in China, the institute and the plant jointly made 3-types of 2-way drive internal combustion tractors: QCZ-90, QCC-90, QCZ-60. Prototypes of all 3 models have completed industrial tests in mines and have proved to be suitable for the adverse environment of the pits. The low-polluting diesel engine, the external purification device, the tractor frame, the transmission system, the steering and power output devices, and the brake system are described. A photo of the QCZ-90 model tractor is included.

AUTHOR: SHEN Chuanzhe [3088 0278 3181]
LIU Zhenhong [0491 2182 3163]
WANG Xu [3769 2485]

ORG: SHEN of Xian College of Metallurgy and Construction; LIU,WANG of Bureau of Construction No 1, Ministry of Railways

TITLE: "Several Viewpoints Concerning the Establishment of A Repair Center of Construction Machines"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 26-29

ABSTRACT: In the current process of adjusting and reforming the economic system, many have advocated the principle of specialization and cooperation and in the machine manufacturing industry, specialized centers for heat treatment, welding, casting, electroplating, etc. have been established and obvious economic and technological advantages have been demonstrated. In the industry of construction machinery repair, problems of repetitious plant, equipment, and personnel, high cost, poor quality, and long repair time, shortage of parts, etc. do exist. Some believe a repair center should be established. Others maintain that as work sites are often in remote areas, a repair center will require machines to be transported over a long distance. The authors propose a method of establishing a repair center to coordinate various local plants to distribute the jobs of major and minor repairs and to resolve problems of buying, manufacturing, repair, storing, and supplying parts.

AUTHOR: YI Xinqian [2496 2450 0051]

ORG: None

TITLE: "Some Suggestions Concerning Reorganizing the Construction Machinery Repair Industry in China"

SOURCE: Beijing GONGCHENG JIXIE [CONSTRUCTION MACHINERY AND EQUIPMENT] in Chinese No 9, 20 Sep 81 pp 29-33

ABSTRACT: In foreign countries, machinery repair may take the following forms: (1) Machines are repaired by the manufacturers; (2) The manufacturer produces a large number of parts for the users to repair the machines or for the repairman to bring the parts to the users for repair; (3) Establishing large specialized repair plants. The USA, England, Czechoslovakia, etc. adopt mostly the first two methods; the last method is most popular in the USSR. In China, specialized machine repair plants have been the system for many years. For example, the Construction Machinery Repair Plant No 2 of the Ministry of Railways is located in Chengdu, Sichuan Province. In 1977, of the 122 construction machines repaired at the plant, only 17 were from within the province. The remaining 105 machines were transported 1000-3000 km to the plant for repair. The author suggests a reorganization of the system having a centralized leadership, local specialized major repair centers, and basic level parts production and repair organizations. In the future, it may be more reasonable to regard machinery repair as one system without having to have a separate system of construction machinery repair.

6168
CSO: 4009/99

AUTHOR: LU Zhongzuo [7120 6945 4373]

ORG: Nanjing Institute of Technology

TITLE: "The Filter Properties and Theoretical Analysis of the Axial Conductor Loaded Helix"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 1-10

TEXT OF ENGLISH ABSTRACT: This paper presents a new problem with the filter properties of the axial conductor loaded helix. By using the equivalent transmission network analysis, it is shown that the filter properties are different from those of the structures as suggested in narrow band TWT. In this kind of structure, the TWT can be constructed not only in narrow band operation, but also in super-wide band operation.

The theoretical analysis of the axial conductor loaded helix shows that its transverse impedance can be loaded low enough, even to 50 ohms, and easily matched to the external coaxial coupler directly, while at the same time it maintains the coupling impedance at rather higher values and obtains high gain in TWT.

One of the distinguishing advantages of the filter type slow wave circuit used in TWT is its property of suppressing the BWO. The axial conductor loaded helix also

[Continuation of DIANZI XUEBAO No 5, 1981 pp 1-10]

has this kind of property. Dr Otto Sauseng of the United States adopted this kind of slow wave circuit in his TWT in 1970 and no BWO occurred, but he gave no explanation. Actually, as is shown in this paper, the suppression of BWO is due to the filter property of the structure. The TWT, when using this kind of structure, shows that the operation is quite stable.

The theoretical calculation method of the axial conductor loaded helix as used in the United States is S.F. Paik's method, while in the USSR N.I. Kravolenko's method is used. However, these two methods mainly give out the dispersion relations, do not point out filter properties, and do not reveal such characteristics as the pass-band, stop band, suppression of BWO, effect of the metallic conductor numbers, the effect of the dimensions of the metallic conductor and the effect of the position of the coaxial coupler. In this paper, all these problems are analyzed and relations are given. In addition, the cold circuit experiment has been performed and the dispersion curve obtained is shown more closely in this method than in Paik's method. Also, the match of the input coupler in the super-wide band is quite good. Therefore, this filter analyzing method can be used to design the loaded helix for super-wide band TWT.

AUTHOR: QIAN Huisheng [6929 1920 3932]
ZHU Qixiu [2612 6386 4423]

ORG: Both of Nanjing Research Institute of Electronics Technology

TITLE: "Index Mappings for Multidimensional DFT from One-dimensional DFT"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 11-21

TEXT OF ENGLISH ABSTRACT: The mappings from one-dimensional data series into multidimensional array, in which the lengths of every pair of dimensions are relatively prime, are the basis of the Winograd Fourier Transform Algorithm (WFTA). This paper presents a general formulation of index mappings for L-dimensional DFT from one-dimensional DFT and shows that the possible number of these mappings is $L!\prod_{i=1}^{L}\phi(N_1)$, where $\phi(\cdot)$ is the Euler function, as for each mapping the transform formulations are given. An example shows that there are several particular mappings whose input and output index mappings are identical when $N = 4\cdot5 = 20$.

Some doubts have been raised about the results obtained by Kolba, Parks and Winograd in discussing the special case L=2. In section V of Kolba and Parks' article, the expressions $r_1 = M_2 \pmod{M_1}$, $r_2 = M_1 \pmod{M_2}$ should be written as $r_1 M_2 = 1 \pmod{M_1}$, $r_2 M_1 = 1 \pmod{M_2}$. In section IV of Winograd's article, formulations for

[Continuation of DIANZI XUEBAO No 5, 1981 pp 11-21]

the index mapping $b_{j_1n_2+j_2} = a_{r_1j_1n_1+r_2j_2n_2} \pmod{n}$ and $B_{k_1n_2+k_2} = A_{s_1k_1n_1+s_2k_2n_2} \pmod{n}$ should be replaced by either $b_{j_1n_2+j_2} = a_{r_2j_1n_2+r_1j_2n_1} \pmod{n}$ and $B_{k_1n_2+k_2} = A_{s_2k_1n_2+s_1k_2n_1} \pmod{n}$ or $b_{j_1n_1+j_2} = a_{r_1j_1n_1+r_1j_2n_1} \pmod{n}$ and $B_{k_1n_1+k_2} = A_{s_1k_1n_1+s_2k_2n_2} \pmod{n}$.

At the 1979 IEEE International Conference on ASSP, the paper by Ellioff and Orton presented the same view as this article, discussing the case of general L, however, and the formulations of index mappings were only meant for two particular cases of $L!\prod_{i=1}^{L}\phi(N_1)$.

AUTHOR: LIU Xing [0491 5281]

ORG: Nanjing Electronic Engineering Institute

TITLE: "Optimal Estimations and Error Analysis of Polynomial Differential"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 22-31

TEXT OF ENGLISH ABSTRACT: This paper discusses the improved least square method for polynomial differentiation. The method is suitable for real-time data processing and real-time control by a computer. It covers optimal estimations of both momentary value and continuous function curve of polynomial differential. Smoothing time may be taken at the sampling time or between any two neighboring samples. For middle-point smoothing, the number of samples may be odd or even. Simple formulas of weight coefficients and estimation errors are also shown in the paper. The law of error changes is easily shown by formulas of estimation errors, which is very useful for the correct use of the least square method.

AUTHOR: LIU Luqin [0491 7627 0530]

ORG: Beijing Institute of Electronic System Engineering

TITLE: "Tracking Doppler Frequency and Its Changing Rate by means of DFT"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 32-38

TEXT OF ENGLISH ABSTRACT: It is often troublesome, or even difficult, for the narrow band system in a coherent-pulse instrumentation radar to precisely track the radial speed of the target under conditions of low pulse repetition frequency of the radar and high speed and acceleration of the target.

A method is presented in this paper to bring about an all digital tracking system based on modified DFT. Such a system can track not only the radial speed of the target, but also its acceleration directly in conditions of low repetition frequency and high target speed and acceleration.

The first part of the paper describes the influence of target radial acceleration on DFT, the modified DFT which can eliminate the said influence, and the two-dimensional response characteristics of the frequency and the frequency changing rate of this modified DFT. The second part explains the method of eliminating speed ambiguity by repetition frequency agility. This method is based on solving

[Continuation of DIANZI XUEBAO No 5, 1981 pp 32-38]

residual equations for root and does not depend on target range information. The third part deals with the narrow band tracking loop based on modified DFT. Two-dimensional error characteristics of the frequency and the frequency changing rate are presented, and a block-diagram of the system is also given.

The author has conducted mathematical simulation of the above system. The results show that the accuracy in the measurement of radial speed and acceleration is quite satisfactory under the condition of comparatively low signal-noise ratio.

AUTHOR: ZHAO Luguang [6392 7627 0342]

ORG: Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "Effect of Junction Capacitance and Spontaneous Recombination on Time Delay of Turn-on of Injection Lasers Modulated by Pulse Currents"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 39-47

TEXT OF ENGLISH ABSTRACT: In this paper the effect of junction capacitance, spontaneous recombination, DC-bias and injected pulse current on time delay of turn-on of injection lasers modulated by pulse currents is analyzed comprehensively. Kinetic equations considering those factors are developed. A variety of possible cases for are discussed, and results for some typical parameters are given. The calculated results are found to coincide with the measured values. When the junction capacitance is not very small (>20 pF), it is an important factor for the time delay just like spontaneous recombination. The reduction of the time delay by DC-bias is not linear, becoming small gradually from zero-bias to DC-bias at threshold. Thus we can obtain the best modulation by DC-bias below threshold.

AUTHOR: ZHAO Yongchang [6392 3057 2490]

ORG: Department of Automation Engineering, Shanghai Institute of Mechanical Engineering

TITLE: "A Topological Technique for the Sensitivity Calculation"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 48-56

TEXT OF ENGLISH ABSTRACT: This paper presents a topological technique for sensivity calculation by means of the signal flow graphs theory. In our signal flow graph, the branch gains for the input branches and the intermediate branches are the nonlinear function of the system parameter for finding the sensitivity. According to the difinition of summing matrix and branching matrix, and by using Tellegen's theorem for signal flow graph, the general expression has been developed. The key to this technique is calculating the sensitivity by direct application of the topological structure of the signal flow graph. The existing results may be considered as special cases of the general expression proposed in this paper. Finally, the application of the expression is illustrated by a concrete example.

AUTHOR: GUO Yanying [6753 5888 3853]

ORG: 23rd Institute, 7th Ministry of Machine Building

TITLE: "Theoretical Analysis of the Microwave Impulse Governed Oscillator"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 57-63

TEXT OF ENGLISH ABSTRACT: Many previous articles considered the operating frequency of an impulse governed oscillator (IGO) difficult to be extended to the microwave band. One of the reasons put forward was that the width of the synchronizing pulse must be narrower than one-fifth to one-third of the period of the VCO, which is relatively difficult to achieve in the microwave band. Some recent literature raised an objection to this, but still considered the narrower the synchronizing pulse for a microwave IGO in the case of non-ideal sample-and-hold, the better. This paper proves that neither of these conclusions is exactly true. In addition, previous articles also doubted the loop stability of IGO, and held that its phase noise might be greater than that of a common phase lock loop. This paper discusses the problems concerning phase noise and loop stability. Theoretical analysis and an IGO experiment at 3 GHz show that a correctly designed microwave IGO has low phase noise, better stability and a simpler, compact strip-line structure. Therefore, further advances of the IGO may be expected.

AUTHOR: SHE Xianye [0152 7359 8768]

ORG: Nanjing Electronic Technology Institute

TITLE: "A YIG Single Crystal Sphere in the Center of the Looped Current"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 64-69

TEXT OF ENGLISH ABSTRACT: With electromagnetic field theory, formation of the impedance of a YIG single crystal sphere resonator coupled by a loop is analyzed in this paper. When the diameter of a single crystal sphere can be compared with the diameter of a loop, a general formula of resonator impedance is derived.

Considering that the surface of the magnetic pole is an ideal magnetic wall, by means of the mirror method the effect of outer magnetic pole on resonator impedance is analyzed quantitatively. The resonator impedance formula derived by the author differs from those by Comstock and Helszajn slightly and proves that the impedance formulas given by Carter and Igarashi are only suitable for the case of the radius of the single crystal sphere being much less than that of a loop.

AUTHOR: LIN Shaochi [2651 4801 1015]
BAO Zhixiang [0545 2535 7449]
GONG Guangyuan [7895 0342 3293]
HUO Yunsheng [7202 5366 3932]
et al.

ORG: LIN of the University of California, San Diego; BAO, GONG and HUO, et al, all of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Study of X-ray Preionized Electron Avalanche Discharge Laser at High Gas Pressures"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 70-74

TEXT OF ENGLISH ABSTRACT: Some experimental results of an X-ray preionized homogeneous discharge laser at high gas pressures are presented. In this device a multi-arc-channel rail gap switch is used to create a fast voltage rise time, and a water-dielectric transmission line is employed as the discharge energy source. Homogeneous discharge lasta about 70 ns in a typical XeCl* gas misture of 2~5 atm, and a laser output energy higher than 1.2 joules has been obtained in an active volume of 2.0 x 1.5 x 70 cm^3.

AUTHOR: LEI Shizhan [7191 0099 3277]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Pulse-width of Excimer Laser"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 75-78

TEXT OF ENGLISH ABSTRACT: Based on the laser oscillation requirements, this paper discusses the condition for increasing pulse-width of excimer laser. In principle, CW operation of excimer laser can be obtained. For example, if dc discharge current density $J \geq 5$ A/cm^2, the XeF* excimer laser can produce CW output. But, under this discharge level, arc discharge is likely to occur and, as a result of arc discharge, laser oscillation will be interrupted. The problem may be solved if an electron beam source is used. However, it is rather difficult now to make a high power electron beam source.

AUTHOR: LI Jingzhang [2621 2417 4545]

ORG: Hubei Institute of Computing Technology, Beijing

TITLE: "Theory of Crosstalk Between Lines"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 79-85

TEXT OF ENGLISH ABSTRACT: A further theoretical analysis of crosstalk between two lines is given. This paper presents the theoretical formulas for calculation of wave for crosstalk between two lines with arbitrary input signal function and arbitrary termination impedance. The practical applications are illustrated by an example.

AUTHOR: CAI Jianming [5591 0494 6900]
WANG Shilin [3769 1102 2651]
GUAN Zhaohua [7070 5128 5478]
CHEN Yuansheng [7115 0337 3932]
CHEN Yujing [7115 3558 2529]

ORG: All of the Institute of Communication Engineering, Nanjing

TITLE: "Digital Processing of the TV Sync and Sound Signal"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 86-90

TEXT OF ENGLISH ABSTRACT: "Gray Scale Sync" is a new technology which can not only implement the "Sound-in-Sync" technique effectively, but also improve the signal to noise ratio of the TV picture by 3 dB. Based on the study of the digital processing of the TV sync and sound signals, we have developed "Gray Scale Sync" equipment capable of handling the PAL format composite color TV signals and also suitable for the reception of overdeviation signals. In this treatise, stress is laid on the explanation of the scheme and the results of the experiments.

AUTHOR: XIAO Dachuan [5135 6671 1557]

ORG: Department of Electrical Engineering, Qinghua University

TITLE: "Alternative Proof of the Existence and Uniqueness Theorems for Nonlinear Resistive Circuit"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 91-94

TEXT OF ENGLISH ABSTRACT: Alternative proofs of two theorems concerning the existence and uniqueness of solutions for nonlinear resistive circuit are given. The colored branch theorem is used to facilitate the test of the condition which must be satisfied by norms.

AUTHOR: LE Weida [2867 0251 6671]

ORG: Shanghai Institute of Metrological Technology

TITLE: "A New Microwave Phase Standard Calibration System"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 95-97

TEXT OF ENGLISH ABSTRACT: This paper describes a new scheme and an experimental system to realize high precision microwave phase calibration by directly heterodyning microwave to low frequency and using a low frequency inductive phase shifter as a standard reference. The accuracy obtained is 0.1 at 5 cm band, and can be increased to ±0.02 using the author's frequency-division method. Some ideas are given for error checking and self-calibration techniques.

AUTHOR: MEI Qizhi [2734 0796 2535]

ORG: Qinghua University, Beijing

TITLE: "Concepts of the Fault Tree's Dual Tree and Success Tree"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 98-99, 104

TEXT OF ENGLISH ABSTRACT: This paper discusses the concepts of the fault tree's dual tree and success tree as follows: 1) The dual tree and the success tree are two different concepts. 2) If the fault tree's mathematical expression is $\varphi(X)$, then its dual tree's mathematical expression will be defined as $\varphi^D(X) = 1-\varphi(1-X)$, the relationship between the fault tree and its dual tree being that their "gates" are different, "AND"↔"OR," and their "bottom events" are completely identical. At the same time, the cut set of the dual tree is the path set of the fault tree and vice versa. 3) The success tree's mathematical expression is $\overline{\varphi(X)} = 1-\varphi(X)$, the relationship between the fault tree and its success tree being that their "gates" are different, "AND"↔"OR," and their "bottom events" are also different and complementary. Strictly speaking, the cut set of the success tree is not the path set of the fault tree and vice versa.

AUTHOR: GU Weijun [7357 1983 0689]
SHAN Guangzhi [0830 1639 2535]

ORG: Both of Tianjin No 1 Radio Equipment Factory

TITLE: "Dual-ramp A/D Converter Error Due to Dielectric Absorption of the Integrator Capacitor"

SOURCE: Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese No 5, 1981 pp 100-104

TEXT OF ENGLISH ABSTRACT: This paper analyzes the dual-ramp A to D converter error due to dielectric absorption of the integrator capacitor with a rigorous mathematical method. It is proved that if the dual-ramp A to D converter runs continuously and if the same voltage has been measured for a sufficiently long time, the dielectric absorption of the integrator capacitor will not cause any error. When measured voltage changes abruptly the dielectric absorption of the capacitor will cause error for the first few measurements. The formula for calculating error and its time constant is obtained.

9717
CSO: 4009/80

AUTHOR: YU Shiwen [0205 1102 3090]

ORG: Beijing University

TITLE: "Large Scale Software System Used in Chinese Language Editing and Typesetting"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 10, 10 Oct 81 pp 2-4

ABSTRACT: A computer-laser Chinese Han character editing and composing system has been designed for the purpose of realizing automation of typesetting work of Chinese language books and newspapers. An information contraction technique is adopted to reduce the quantity of data to 1/500 so that a magnetic disk of a capacity of 5 billion bytes is sufficient to hold all the character data and after processing, the phototypesetting control computer can restore the contracted data into a dot matrix. The roller output is by the line with a scanning density of 29.2 lines/mm. The software is a part of the basic structure. Its testing began in the middle of 1979 and was completed toward the end of 1980. This paper describes the software, after a brief introduction of the hardware system. This paper is a selection from the Collection of Data of Beijing District Software Engineering Symposium, Mar 81.

AUTHOR: HE Mi [0149 1348]

ORG: None

TITLE: "Certification of Stereo-X-Ray Television"

SOURCE: Beijing DIANZI KEXUE JISHU [SCIENCE AND TECHNOLOGY OF ELECTRONICS] in Chinese No 10, 10 Oct 81 p 45

ABSTRACT: The Hangzhou University, the Ningbo Research Institute of Stereoscopic Television, and the Hangzhou Hospital No 1 carried out joint research to produce the stereo-x-ray television. In the research process, 3 schemes were successfully created, including the 2-camera mechanical synchronization scheme, the 2-camera electronic synchronization scheme, and the single camera electronic synchronization scheme. The last scheme was presented for certification on 20 Jun 81. This scheme is based upon the theory of parallax of the two eyes. Using two grid control x-ray tubes and one camera, stereo-x-ray images are successfully obtained. With the new grid control x-ray emission technique, the x-ray radiation dosage is obviously reduced. Test applications of more than a year have demonstrated that the design is correct, reasonable, and advanced, and the images are lifelike, clear, and very 3-dimensional looking. Clinical tests in more than 200 cases indicate that the machine does have important value in medical diagnosis, but its screen (9-inch) is not big enough and there is a low frequency scintillation phenomenon in the background of the images. The paper gives no indication of whether the machine is approved or disapproved.

6248
CSO: 4009/103

AUTHOR: WU Boxiu [0702 0130 0208]
ZHUANG Kunjie [5445 2492 2638]
LIN Fuhua [2651 4395 5478]
HE Liquan [0149 4539 2938]

ORG: All of Nanjing Institute of Technology

TITLE: "An Experimental Modulized Communication System Using MIC"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 1-7

TEXT OF ENGLISH ABSTRACT: This paper reviews the development of a 1 GHz communication relay system by using a combination of lumped microfilm technique and distributed microstrip technique. All the channel equipment of this system are composed of a combination of 8 kinds of universal and special modules, which are in turn composed of 11 kinds of universal and special chipped circuits. Hence the equipment has the advantages of small size, light weight, good exchangeability, easy repairing and small power consumption.

This paper gives the main specifications and block diagrams of the equipment, illustrating how different equipment of the system can be assembled from the modules.

AUTHOR: ZHUANG Kunjie [5445 2492 2638]
LIN Fuhua [2651 4395 5478]

ORG: Both of Nanjing Institute of Technology

TITLE: "An Experimental 1 GHz Integrated Transmitter"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 8-17

TEXT OF ENGLISH ABSTRACT: This paper presents the principles and characteristics of the following modules: power amplifier, phase modulator and up converter, which are used in the transmitter of the 1 GHz microwave relay system. These modules are assembled with some universal and special chipped hybrid integrated circuits, made by using microfilm technique. The characteristics of the automatic level control loop in the power amplifier are analyzed, and experimental results are also given.

AUTHOR: ZHUANG Kunjie [5445 2492 2638]
HE Liquan [0149 4539 2938]

ORG: Both of Nanjing Institute of Technology

TITLE: "An Experimental 1 GHz Integrated Receiver"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 18-23

TEXT OF ENGLISH ABSTRACT: This paper presents the block diagram and its chipped circuits of an experimental microwave integrated receiver. It discusses the technique of the balanced circuits which is widely used in the receiver.

The experimental receiver has been used in a microwave relay system for TV transmission and digital communication, with satisfactory performances.

AUTHOR: WU Boxiu [0702 0130 0208]

ORG: Nanjing Institute of Technology

TITLE: "A Duplexer with Directional Filter Used in 1 GHz Communication System: Analysis of Its Properties and Determination of Its Specifications"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 24-37

TEXT OF ENGLISH ABSTRACT: This paper presents the principle and characteristics of a duplexer with directional filter used in 1 GHz modulized communication system using MIC. A power spectrum equation of a double-polarity multiplex ΔM PSK signal transmitted in this system is derived. Based on this equation, this paper gives a method for determining the main specifications of this kind of duplexer with the aid of the TI 59 programmable calculator. Finally the structure diagram and selectivity curve of an experimental duplexer which was designed and developed according to those specifications are given.

AUTHOR: ZHOU Shougen [0719 1108 2704]
SUN Minsong [1327 2404 2646]

ORG: Both of Nanjing Institute of Technology

TITLE: "A 21 cm Feedback Radiometer of All Solid State"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 38-44

TEXT OF ENGLISH ABSTRACT: A microwave feedback radiometer used for research on microwave characteristics of various materials is discussed in this paper. The receiver circuit and components which are easily influenced by drift are connected to a feedback network in order to eliminate the effect of the change of gain. Thus the stability of the radiometer is improved.

The principle and design of the system are analyzed; microwave integrated circuits are described. A calibration curve and experimental data are given in the paper.

Output noise fluctuation (rms) of the equipment is 0.35°K ± 0.1°K.

AUTHOR: WANG Anhua [3769 1344 5478]
QIAN Linjun [6929 7207 0689]

ORG: Both of Nanjing Institute of Technology

TITLE: "Synthesis of the Logical Networks at Remote Controlled Terminals"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 45-52

TEXT OF ENGLISH ABSTRACT: This paper presents a new scheme of encoding and decoding of constant ratio code by the minimization principle of combinational logical networks. It simplifies and improves the terminal scheme of the existing radio remote controller and makes the remote controller for a group of machines realizable on the building-block principle.

AUTHOR: SONG Wenzhong [1345 2429 1813]
XU Sixin [1776 0843 9515]

ORG: Both of Nanjing Institute of Technology

TITLE: "Software for COR-LS Identification"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 53-64

TEXT OF ENGLISH ABSTRACT: This software can be used to process data in identification experiments for open- or closed-loop systems to give an estimate of system parameters using the correlation, least squares or correlation-least squares method. It also includes an automatic searching program for the order and time delay of the model.

The software is programmed in ALGOL-60. It is used to process a series of experimental data to establish the dynamic model of a boiler in a power plant.

AUTHOR: QIAN Weimin [6929 3634 3046]
YE Bingsheng [5509 3521 3932]
LIN Jiqun [2651 3444 5028]

ORG: All of Nanjing Institute of Technology

TITLE: "Generating System for Package of User's Programs of Process Control Computers"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 65-70

TEXT OF ENGLISH ABSTRACT: A package of user's programs for process-control computers, model PCP-131-1, was verified in December, 1980. In order to extend its application, to develop new systems and to suit the different requirements of various users, we have designed a generating system. A simulation test has proved the generating system to be effective after debugging.

This article deals mainly with the principles and methods used in designing the system and the important technical measures taken. The system is suitable for model DJS-100 and other compatible computers.

AUTHOR: CAO Shu [2580 1859]

ORG: Nanjing Institute of Technology

TITLE: "Strength Function of Bulk Polariton in Antiferromagnet with Externally Applied Magnetic Field"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 71-78

TEXT OF ENGLISH ABSTRACT: When an electromagnetic wave propagates in an antiferromagnet, it will interact with the magnons of the antiferromagnet and form bulk magnetic polariton in the antiferromagnet. The energy associated with the polariton consists of two parts: One portion is the energy associated with the electromagnetic field and the other portion is the energy associated with the excited magnons. With the help of the theory of electromagnetic field and the torque equations of antiferromagnets, the relation between energy density and frequency has been studied and the strength functions of bulk polariton in the Voigt configuration are presented.

AUTHOR: WANG Peilun [3769 0160 4858]

ORG: Nanjing Institute of Technology

TITLE: "Bending of a Bar with an Isosceles Triangular Cross Section"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 79-84

TEXT OF ENGLISH ABSTRACT: Because of the difficult mathematics involved, an exact solution for the problem of isosceles triangular bars in bending has been carried out only in specific cases. The stress function to be presented in this paper is applicable for all values of 2α between 0 deg and 90 deg. Timoshenko's stress function and solution may be viewed as a special case of this general stress function and solution.

AUTHOR: DAI Decheng [2071 1795 2052]

ORG: Nanjing Institute of Technology

TITLE: "Nonlinear Nonholonomous Constraints in Analytical Mechanics"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 85-92

TEXT OF ENGLISH ABSTRACT: In this paper the definition of virtual displacement, Chetaev's definition, commutative law of operators and the equation of motion in nonlinear nonholonomous systems are discussed.

AUTHOR: LU Zhitao [0712 1807 3447]

ORG: Nanjing Institute of Technology

TITLE: "Calculation of Normal Section Strength of Reinforced Concrete Members Subjected to Biaxial Bending"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 93-100

TEXT OF ENGLISH ABSTRACT: This paper reviews the existing method for calculating normal section strength of reinforced concrete members subjected to biaxial bending. Based on the tests carried out in our institute, a new method of calculation and new formulas are proposed.

The proposed method has been verified by test results obtained from investigators at home and abroad. Comparison shows that the proposed method is clearer in conception and more accurate than the method given in the current Design Code (TJ 10-74).

AUTHOR: CHENG Wenrang [4453 2429 3475]

ORG: Nanjing Institute of Technology

TITLE: "An Experimental Study on the Cracking Strength, Stiffness and Crack Width of Reinforced Concrete Members with Rectangular Section Subjected to Eccentrical Tension"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 101-116

TEXT OF ENGLISH ABSTRACT: Based on the theoretical analysis and test results, this paper presents a series of new formulas for calculating cracking strength, stiffness and crack width of reinforced concrete members with rectangular cross section subjected to eccentrical loads. The formulas are compatible with those for the two extreme cases of the axial tension members and the pure flexure members, and are very convenient for use in practical design computations.

AUTHOR: YUAN Biguo [5913 1801 2654]

ORG: Nanjing Institute of Technology

TITLE: "An Experimental Study of Plastic Hinges for Reinforced Concrete Members Subjected to Bending and Axial Load"

SOURCE: Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 117-129

TEXT OF ENGLISH ABSTRACT: This paper presents some test results of reinforced concrete members subjected to bending and axial load. The measured data, including the formation of plastic hinges, the actual length of plastic regions, the distributions of curvature and the rotation capacity of plastic hinges, are analyzed. Some formulas of calculation are proposed based on the results of analysis. Measured data, including deflections and ductilities of specimens, are listed in this paper also.

9717
CSO: 4009/73

AUTHOR: LAI Zuhan [6351 4371 3211]
CHEN Longjiang [7115 7127 3068]
ZHANG Jiamin [1728 0857 2404]
et al.

ORG: All of the Physics of Metals Teaching and Research Group

TITLE: "The Determination of Crack Initiation in TPB Specimens of Medium-high Strength Steel by means of Computer"

SOURCE Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 1-12

TEXT OF ENGLISH ABSTRACT: An analytical method for determining the initiation of crack growth in TPB specimens is developed. Several kinds of medium-high strength steel with yield strength in the range of 53-115 kg/mm^2 are used to test the method. It is satisfactory in J_{Ic} determination of a single specimen when it is compared with the usual multi-specimen method.

The dimensions of the specimens are $B \times W \times L = 20 \times 24 \times 110$ mm, where B, W, L are respectively the thickness, width and length of the specimen. With such size limitation, it is found that the steel investigated falls into different types. It is important to distinguish the plastic behavior at the crack tip before the

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 1-12]

initiation of crack growth. The analytical method developed in this paper takes into account the possible change of work hardening capacity at the crack tip region.

AUTHOR: GUAN Yingnan [7070 4481 3948]

ORG: First Teaching and Research Group, Department of Mathematics

TITLE: "A Computing Method of the Number of Lateral Sides and the Coordinates of Vertices of a Mixture Convex-polyhedron Having Lower and Upper Bounds"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 13-22

TEXT OF ENGLISH ABSTRACT: A mixture problem having lower and upper bounds is expressed as

(1)

Its interest region is an irregular convex-polyhedron in (n-1) dimension space. By use of the pseudo-component transform

$$z_i = (x_i - a_i)/R \qquad (i = 1, 2, \ldots, n) \qquad (2)$$

the expression (1) can be reduced to a mixture problem having upper bound only, i.e.

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 13-22]

where

(3)

In this paper, a computing procedure applying (b''_1, b''_2, ..., b''_n) to the direct construction of coordinates of vertices in expression (1) is given. It is a simplified method in comparison with the conventional computing method. At the same time a formula

$$\ell = n - u + w \qquad (4)$$

is given to directly compute the number of (n-2) dimensional lateral sides of a (n-1) dimensional convex-polyhedron, where

ℓ--number of (n-2) dimensional lateral sides;
u--number of b''_i (= 1, 2, ..., n), equal to 1;
w--number of vertices of the reversely placed simples

(5)

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 13-22]

such a simplex lying outside the normal simplex

(6)

AUTHOR: GUO Bowei [6753 0130 0251]
XUE Jiaqing [5641 0857 1987]
YANG Zekuan [2799 3419 1401]

ORG: GUO and YANG of the Department of Heat Engineering; XUE of the Department of Mathematics

TITLE: "A Group of Governing Equations and Their Solutions for Determining Theoretical Flame Temperature"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 23-31

TEXT OF ENGLISH ABSTRACT: Theoretical flame temperature is a thermodynamic quantity of importance in many combustion problems and is also an important parameter for some thermotechnical calculations. A group of nonlinear equations, which may be considered governing equations solvable to theoretical flame temperature, is presented in this paper, with such equations considered bases for conservation of matter under chemical reaction, chemical equilibrium and enthalpy conservation. In order for such a group of equations to be solved conveniently, some parameters involved and related to the unknown value to be solved, i.e., theoretical flame temperature, are taken in the form of tabular data. For this reason, the methods usually used for solving nonlinear equations, e.g., Newton-Raphson's method, are inapplicable. The existence of the unique solution for $\psi_2(\nu,t) = 0$ having been

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 23-31]

proved, the equations presented in the paper can then be solved by a computer with the introduction of bi-dichotomy (applied first to the above-mentioned equation, and then to $f(u,v,t) = 0$ respectively). Thus, a method for determining theoretical flame temperature is provided with precision and simplicity. A source program for computing theoretical flame temperature and composition of combustion products of industrial fuel is made. Finally, a practical example of computing natural gas is given.

AUTHOR: NING Baolin [1380 1405 2651]
SHANG Deyi [1424 1795 5030]

ORG: Both of the Smelting Furnace Teaching and Research Group

TITLE: "A Study of One-way Direct Exchange Area Due to Radiant Heat Transfer in an Enclosed System"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 33-44

TEXT OF ENGLISH ABSTRACT: The predictive calculations of the distribution of temperature and heat flux in a reheating furnace may represent the most important prediction of industrial furnaces. They are helpful not only in simplifying the automatic control of furnaces, but also in enhancing the efficiency of thermo-technical automation. The main predictive calculation for this purpose performed currently is based on the zone method by H.C. Hottel. Since this method has only a restricted application since the elementary gaseous zones (or surface zones) must be divided into the form of cubes (or into squares), it is necessary to introduce a new method for calculating the one-way direct exchange area by which the prediction for industrial furnaces can be used more widely and conveniently. With the replacement of cubic (or square) zones by rectangular zones, the induced formulas for calculating one-way direct exchange areas under eight different conditions are derived. Two types of induced formulas, which may be considered

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 33-44]

as representative of those under eight different conditions, are offered in this paper. In one case the direct exchange area lies between two gaseous zones. The induced formulas derived, determining the allowed values of exchange areas and providing for the equations of heat equilibrium, are applicable to the mathematical models of computers. The results computed are relatively precise. A group of equations of heat equilibrium in which all the divided zones in a furnace are involved may be solved simultaneously by a computer. Therefore, the space distribution of the temperature of gas and surface and that of the heat flux can be determined. Finally, the accuracy of results calculated by a computer is discussed and a ratio of length to width of divided zones of not more than 1.2 is proposed.

AUTHOR: WANG Kuihan [3769 7608 3352]
CUI Chuanmeng [1508 0278 1322]

ORG: Both of the Metallurgy and Physical Chemistry Teaching and Research Group

TITLE: "On the Corrosion of Mo-MgO Ceramal Casing Tube under Continuous Measurement of the Temperature of Molten Steel"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 45-52

TEXT OF ENGLISH ABSTRACT: Mo-MgO ceramal casing tubes, useful for shielding thermocouples during continuous measurement of the temperature of molten steel, have been applied to such pilot-plants as converters, electric arc furnaces and ladles since they were first developed in 1974. It has been found that some Mo-MgO ceramal casing tubes differ from each other in their service life. In order to find out the corrosion mechanism and to prolong the service life of these casing tubes, several corrosion experiments were performed by analyzing the samples of Mo-MgO ceramal casing tubes of different lifetimes. Moreover, a physicochemical experiment was done for determining the corrosion effect of such factors as pigging, steel and slag with a crucible made from the same material as the Mo-MgO ceramal casing tube. The results of the experiments are as follows:

1. Corrosion resistance to steel or slag of Mo-MgO ceramal not only depends on its constituents, but also on its microstructure.

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 45-52]

2. With the shielding atmosphere of inert gas at a temperature of 1650°C, the ceramal is corroded by pigging, slag and steel in order of their corrosivity.
3. The miscibility between Fe and Mo is the dominant factor of metallic phase corrosion and the corrosion speed depends to a large extent on the diffusion rate of Fe in Mo-Fe solid solution, and the thinner the interlayer, the more quickly the ceramal corrodes.
4. The corrosion effect of Fe-C melt on Mo-MgO ceramal is intensified with the increase of carbon contents.
5. The corrosion effect of slag on Mo-MgO ceramal is mainly decided by the oxidizability of slag.

AUTHOR: YANG Zupan [2799 4371 4323]
ZHAO Nairen [6392 0035 0088]

ORG: YANG of the Metallurgy and Physical Chemistry Teaching and Research Group; ZHAO of the Semiconductors Teaching and Research Group

TITLE: "An Expression of Basicity for Blast Furnace Slags Containing Titanium Oxide"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 53-58

TEXT OF ENGLISH ABSTRACT: In view of the fact that two slags are equal in CaO activity when they are equal in basicity, this paper gives an expression of basicity of the slags containing titanium oxide as

$$R = \frac{\%CaO}{\%SiO_2+0.61\cdot\%TiO_2}$$

The expression has been determined by means of measuring the activity of CaO in TiO_2-CaO-SiO_2-Al_2O_3-MgO slags.

AUTHOR: ZHAN Qinglin [6124 1987 7207]
JI Chunlin [0370 2502 7207]

ORG: Both of the Physics of Metals Teaching and Research Group

TITLE: "On the Kinetics of Reduction of TiO_2 in Blast Furnace Slags by Graphite Carbon"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 59-65

TEXT OF ENGLISH ABSTRACT: The rate of reduction of TiO_2 in $CaO-SiO_2-Al_2O_3-MgO-TiO_2$ liquid slags is measured under such conditions that only TiO_2 can be reduced by graphite carbon at a temperature of 1400~1530°C. The rate constant of reduction is calculated by

$$\lg K = -\frac{16.0 \times 10^3}{T} + 6.320$$

and the activation energy $\Delta E = 73.1$ kcal/mol.

AUTHOR: YANG Hongcai [2799 3163 2088]
ZUO Xiuzhong [1563 4423 1813]
LIU Guolu [0491 0948 4389]

ORG: YANG of the Department of Metal Materials; ZUO and LIU both of the Department of Physics

TITLE: "Fe-Si System Alloys: Their Valence Electron Structures, Plasticity Mechanism and Magnetic Properties"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 67-77

TEXT OF ENGLISH ABSTRACT: This paper presents an analysis of the valence electron structures of several commercial Fe-Si system alloys based on the empirical electron theory first proposed by Professor S.H. Yu in 1978. Parameters of the valence electron distribution, such as number of covalent electrons, number of lattice electrons and pair number of bond covalent electrons, are calculated and tabulated. Magnetic moments of several Fe-Si alloys with different constitutions, calculated by using Professor Yu's theory, are quite consistent with the experimental results. It is observed that there exists a regularity between the change of chemical constitution and the hybridization transfer in these alloys. It seems that there is an inherent rule in Fe-Si alloys such that the number of lattice electrons presents abrupt changes when the Si content is equal to about 2.6 wt percent and 4.9 wt

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 67-77]

percent respectively. This figure also shows that the curves of plasticity behavior (elongation δ percent and area reduction ψ percent) and the curve of the number of lattice electrons (n_1) resemble each other in shape, i.e., the plastic deformation is mainly caused by the effect of lattice electrons.

AUTHOR: YU Heji [5713 0735 3444]
JIN Guodong [6855 0948 2767]
SU He [5685 4421]

ORG: YU and SU both of the Theoretical Mechanics Teaching and Research Group; JIN of the Rock Fragmentation Teaching and Research Group

TITLE: "The Finite Element Method Used for Analyzing the Mechanism of Rock Breaking with a Wedged Cutter"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 78-88

TEXT OF ENGLISH ABSTRACT: This paper introduces the finite element method used for analyzing the contact stress acting on rock by a wedged cutter. In such a case the contact stress can be considered a structure consisting of both plane stress elements and truss elements. Its global stiffness matrix is expressed as

$$[K]=\sum_{e=1}^{a}[K_p^{(e)}]+\sum_{e=1}^{b}[K_t^{(e)}],$$

where $[K_p^{(e)}]$ is the general stiffness matrix of plane stress elements and $[K_t^{(e)}]$ is the stiffness matrix of the truss respectively, and the latter must be specially assigned. In this way several stress fields (σ_{max}, σ_{min} and $\sigma_{max}-\sigma_{min}$ before the suddenly lumpy breaking) in rock under pressure by a wedged cutter with a round

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 78-88]

end are calculated and shown. The whole process of rock breaking is programmed in such a way that a method of load increments is applied since the indefinite load and the stress release are taken into account due to the non-elasticity of rock.

In conclusion,
1. Powdered kernels take form initially. With the sudden energy release due to the energy stored in the powdered kernels, the rock breaks into large lumps suddenly under tensile-cracking.
2. Tensile failure is the main cause and also the main form of this suddenly lumpy breaking.

AUTHOR: DING Yaowu [0002 5069 2976]
CHI Hanzhong [6688 3352 1813]
WANG Shixuan [3769 0013 6513]

ORG: DING of the Department of Machinery; CHI of the Department of Mathematics; WANG of the Shenyang Heavy-duty Instruments Plant

TITLE: "A New Analysis of the Strength and Stiffness of the Gyratory's Main Shaft"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 89-96

TEXT OF ENGLISH ABSTRACT: Based on analyzing the prevailing loading method for the gyratory's main shaft, a more practical way of loading is suggested in this paper. In general, the crushing force is calculated according to the power of the equipped motor, but such an assumed calculation is unreasonable. Here it is proposed that calculating the crushing force ought to be in accordance with the pressure measured from the hydraulic cylinder (as shown in the mechanics model). By means of the semi-analytical FEM, the three-dimensional strains and stresses at various points of a main shaft, e.g., those of a light type 1200 gyratory, are discussed and calculated by a computer. As a result, the strain of the main shaft, the normal stresses (σ_1, σ_2 and σ_θ) and the principal stresses (σ_1, σ_2 and σ_3) on the 90° meridian section are shown. It is found that the stresses and

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 89-96]

various strains of the main shaft take place with maximum values in case of loading on its lower part and with minimum values in case of loading on its central part. This method, together with its results, may be useful in analyzing the strength and stiffness of the main shaft of a gyratory more precisely. In addition, this method is a valuable reference for designing other heavy-duty shafts.

AUTHOR: CHEN Baozhi [7115 1405 2535]
GUAN Shaozong [7070 4801 1350]
CHEN Rongce [7115 2837 4595]

ORG: All of the Ventilation Teaching and Research Group

TITLE: "On the Air Flow Structure of Forced Ventilation in Tunnels and Its Effect on Dust Removal"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 97-105

TEXT OF ENGLISH ABSTRACT: The space near a stope in a tunnel, beyond the end of the vent jet-flow, is, in general, considered to be a "stagnation zone" in which the ventilation seems to be ineffective, and the functional range of forced ventilation L_u is equal to the range of the jet-flow, or it may be expressed as

$$L_u = (4\sim5)\sqrt{S}$$

where S is the cross section area of a tunnel. But the expression does not conform to reality. The fact is that the dust concentration in the atmosphere, even if L_u is rather more than $(4-5)\sqrt{S}$, is still below the dust cleaning standard and no dust accumulation takes place. It is found by simulating tests and practical measurements that there exists what we call the secondary flow circulation beyond the range of vent jet-flow. The behavior of secondary flow circulation and its effect on dust

[Continuation of DONGBEI GONGXUEYUAN XUEBAO No 3, 1981 pp 97-105]

removal were investigated in our research. The functional range of forced ventilation will be increased by as much as a half when the secondary flow circulation is appropriately used to remove the dust in the tunnel under certain productive conditions. The air output required from the duct exit Q_0 can be calculated for using the secondary flow circulation to remove dust by existing ventilating devices. The calculating formulas are given as

$$Q_0 = (0.5\sim0.6)\cdot k_1\cdot S$$

or

$$Q_0 = \frac{G}{k_2(C_2-C_0)}$$

where k_1--coefficient due to the exhausted gas from pneumatic drills;
k_2--equivalent coefficient, determined by experiments;
G --dust due to drilling (mg/s);
C_2--dust concentration within the secondary flow circulation;
C_0--dust concentration at duct exit.
Choose the greater value resulting from the above-mentioned formulas for Q_0.

AUTHOR: YUAN Deyu [6678 1795 3768]

ORG: Natural Dialectics Teaching and Research Group

TITLE: "Form and Feature--An Exploration of Natural Science in Ancient China"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 107-114

TEXT OF ENGLISH ABSTRACT: As a dominant form of natural science in ancient China, empirically-based science has developed uninterruptedly for a long historical period. It is a main feature of the historical development of science and technology in ancient China. The heritage of such empirically-based science is undoubtedly precious, but several branches among this treasury have never been explored enough by means of theoretical science up to now. As a form of science, empirically-based science developed mainly by ancient craftsmen is, after all, not advanced. For the modernization of science and technology in China, we ought to critically inherit the tradition of ancient empirically-based science and, more importantly, to combine both the age-old tradition of craftsmen of ancient China and the magnificent scholar's tradition of great Chinese culture.

AUTHOR: LIANG Ningyuan [2733 1380 0337]

ORG: Metallurgy and Reaction Engineering Teaching and Research Group

TITLE: "On the Macrokinetics of Metallurgical Process"

SOURCE: Shenyang DONGBEI GONGXUEYUAN XUEBAO [JOURNAL OF NORTHEAST INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 115-126

TEXT OF ENGLISH ABSTRACT: The macrokinetics of metallurgical processes plays an important part in metallurgical physicochemistry and serves as a link between engineering science (such as transport phenomena and physicochemistry) and metallurgical engineering. This is also an application of transport phenomena to metallurgical reactions and thus always plays an important role in metallurgical reaching engineering. This paper describes the significance of macrokinetics in metallurgical reaction engineering and gives a comprehensive review of the research done on the subject in recent years. The essential aspects of the study of macrokinetics are pointed out in detail and a survey of macrokinetics is made in the conclusion.

9717
CSO: 4009/76

AUTHOR: GENG Ruicheng [5105 3843 2052]

ORG: None

TITLE: "Plasma Chemistry Gaseous Precipitation Equipment"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: The DD-500 plasma chemistry gaseous phase precipitation equipment jointly made by the Beijing Instrument Plant and the Research Institute of Machine Industry Automation of the First Ministry of Machine Building has gone through certification in Beijing, most recently. It can precipitate a thin film of specified composition on semiconductor surface under a low temperature condition. It is mainly used to precipitate silicon nitride film in the large scale integrated circuit purification process. The evenness of the film is less than 3 percent and the work process is found to repeat very well. Stainless steel is used for the gas pathway system and it is well sealed; therefore, it is corrosion resistant and will not contaminate. Operation for a prolonged period of time has proved the instrument to be reliable.

AUTHOR: YE Decheng [0673 1795 2052]

ORG: None

TITLE: "Precision Digital Voltameter Testing Equipment"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: The Shanghai Electrical Meter Plant has made a highly precise potentiometer type digital voltameter testing equipment. Actual application and inspection by related metrological departments have found its accuracy to reach 5/100,000. Its appearance has resolved the difficulty of testing in the process of mass production of digital voltameters. When it is used with a precision voltage divider, it may also be used to measure high voltages of 0-1000 v.

AUTHOR: LIU Runjiu [0491 3387 0036]

ORG: None

TITLE: "New Type Temperature Actuator"

SOURCE: Beijing YIQI YU WEILAI [INSTRUMENTATION AND FUTURE] in Chinese No 9, Sep 81 p 22

ABSTRACT: Shenyang Research Institute of Instrument and Meter Technology has succeeded in making a new type highly sensitive variable temperature instrument. A diffusion silicon strain resistor is used as the temperature measuring component in a range of -20 to +80°C. In a range of every 30°C measured, its precision is ±0.2°C; for every 50°C measured, its precision is ±0.5°C. Its general sensitivity is 3-4 millivolt/°C. Its sensitivity may even be raised according to the need. It is equipped with direct reading electric meter to show the temperature. Compared with those made of metal resistors or thermal couples, its cost is lower and it is more adaptable.

6168
CSO: 4009/102

Printing Technology

AUTHOR: None

ORG: None

TITLE: "Printing Science Symposium Held in Yantai"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 1981 p 2

ABSTRACT: On 3-10 Sep the National Bureau of Publication called a printing science symposium in Yantai of Shandong Province. A total of 51 delegates representing provincial, municipal, and autonomous region bureaus of publication, research institutes of printing technology, and printing plants, as well as the National Science Committee, the China Printing Company, the China Printing Materials Company, and the Shanghai Publication and Printing Company attended. They learned the Central Communist Document No 14 (1981), exchanged experiences concerning scientific research and technological reform, and discussed policies and responsibilities of research work in printing science. The delegates agreed for a certain period of time in the future, the responsibilities are (1) To promote modernization emphasizing book and journal printing; (2) To strengthen research on equipment, materials, and work processes simultaneously; (3) To strengthen scientific research and technological reform; (4) To learn, digest, and absorb foreign research results in printing science. WANG Yitong [3769 4135 0681] spoke of his observation of the condition of the phototypesetting machine in Japan. In his concluding speech, SHI Yucai [0670 5148 2088] spoke of, among other things, the plan to publish a printing science bulletin and someone's proposal of establishing an agency for regular study of policies of printing technology.

AUTHOR: ZHOU Junyan [0719 0193 1484]

ORG: Beijing Municipal Research Institute of Printing Technology

TITLE: "Positively Carrying Out the Development Plan of Printing Technology"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 81 pp 6-7

ABSTRACT: In view of China's large population and limited capital, modernization of printing technology cannot depend upon large scale importation of new technology, new materials, and new equipment. The existing industries must proceed with reasonable technological reform to reduce consumption, to improve quality, and to increase efficiency. The next important measure is to have a development plan. The author believes that the plan should involve full utilization of existing letterpress printing plants. Under the goal of improving the quality, efficiency, and productivity, the work of technological reform and pollution elimination to protect the environment should be developed. With the existing plants as the foundation, offset and color offset capability should be steadily developed. Special machines to print office and business forms and technical courses to improve and train printers should also be included in the plan. These and other viewpoints of the author with respect to improving printing technology in China are presented.

AUTHOR: A Pan [7093 0982]

ORG: None

TITLE: "The MDC-I Color Transmission Density Meter Certification Conference Held in Wenzhou"

SOURCE: Beijing YINSHUA JISHU [PRINTING TECHNOLOGY] in Chinese No 5, 81 p 12

ABSTRACT: The Wenzhou Automation Equipment Plant has successfully made the MDC-I color transmission density meter. This is an instrument extensively used in modern printing, motion picture, television, and photography to test the optical density of colors of light sensitive materials or dyes. In Mar 81, the Wenzhou Municipal Bureau of Machine Industry called a meeting to certify this instrument and delegates representing Chinese Academy of Metrological Science, the General Bureau of Machine Application of the First Ministry of Machine Building, the Department of Optics of Zhejiang University, and the Shenyang Research Institute of Printing Technology attended. The instrument was tested with the standard density gradient meter of the National Academy of Metrology and examined under various other conditions. The delegates agreed that this new product is accurate, good looking, and compact and all its technical indices meet the design requirements. The manufacturer was given approval to produce it in batches.

6168
CSO: 4009/101

AUTHOR: HU Hansheng [5170 3352 3932]

ORG: Ore Prospecting Division, Hunan Provincial Bureau of Geology

TITLE: "Collection of Experiences of Ore Prospecting Engineering in Hunan Province: A Brief History of Drilling Prospecting"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 5, 20 Oct 81 pp 1-2

ABSTRACT: In 1952 the Ministry of Geology dispatched 2 prospecting teams composed of geological drilling prospecting specialists to come to Chaling and Shuikou Mountain to develop drilling prospecting work. This was the beginning of this technology in Hunan. In these 30 years 4.68 million m of drilling prospecting work has been completed in the province and reserves of 72 types of ores, including coal, iron, manganese, phosphorus, tungsten, mercury, lead, and zinc within the province of Hunan have been clarified. This technology has contributed a great deal to the search for underground treasures of Hunan and to the socialist construction of the fatherland. This paper describes briefly how the drilling prospecting technology was brought to the province, how the teams were organized, and how the drilling projects were managed, as well as difficulties which the teams had to overcome step by step and the progresses and accomplishments of these 30 years.

AUTHOR: HUANG Shaodong [7806 4801 2767]

ORG: Ore Prospecting Division, Hunan Provincial Bureau of Geology

TITLE: "The Method and the Effect of Extending Diamond Drilling by the Bureau"

SOURCE: Beijing TANKUANG GONGCHENG [PROSPECTING ENGINEERING] in Chinese No 5, 20 Oct 81 pp 2-6

ABSTRACT: The Hunan Provincial Bureau of Geology began to adopt diamond drill bits in 1974. By 1980, the technology has undergone 3 stages of experimentation, extension, and stabilization. The bureau had,in 1980, 7 teams and 25 diamond drills. Two of these teams have basically implemented the technique and have accumulated 285,083 m (including the use of mixed drills), with an average efficiency of 375.7m. The objectives include prospecting for mercury, manganese, gold, copper, lead, zinc, tungsten, molybdenum, iron, and phosphorus. It has been preliminarily demonstrated that diamond drills are efficient, less steel consuming, fewer accidents, easier to be moved around, and resulting in shorter prospecting cycles. Just as the introduction of any other new technology, there have been many difficulties and problems. Chiefly, in the first 2-3 years, drill bits were found to be extremely easily damaged, lasting only 20-30m per bit. The efficiency of the diamond drill was found to be not very different from the large caliber drills. Some teams decided to give up because of the excessive cost of the drills. Methods adopted to covercome these difficulties are described. Problems of preventing slanting holes, plugging up leaks to protect the hole, further improving efficiency and reducing cost, etc. are still being studied.

6168
CSO: 4009/119

AUTHOR: CUI Zhengzuo [1508 2973 0146]

ORG: None

TITLE: "Line Concentration in Digital Switching Systems"

SOURCE: Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 7, Jul 81 pp 33-41

ABSTRACT: Line division of digital switching systems includes the 2 categories of space division concentration and time division concentration. After briefly introducing the characteristics of typical forms of both types, this paper proceeds to compare them from viewpoints of technology, economy, and adaptability for future development. Based upon the current status and future trend of development of various countries of the world, preliminary viewpoints concerning the form of line concentration of digital switching system of urban telephone facility are proposed.

6248
CSO: 4009/100

Water Conservation

AUTHOR: None

ORG: Huang County Water Conservancy Office, Shandong Province

TITLE: "Main Methods of Effective Water Conservancy Installation Management and Improvement of Economic Results in Huang County, Shandong"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 4-8

ABSTRACT: This county of 531,000 persons, 60 percent of whose 611,000 mu of agricultural land is level, has an average annual rainfall of 630 mm, 70 percent of it in July-September, and has had to deal with the problem of spring drought, summer waterlogging and fall drought. The main water conservancy management measures adopted since the 1960's are summarized. In the late 1970's major safety efforts were made on installations, and some dams were made capable of withstanding rains of an intensity encountered an average of once in 300 or 500 years. Similar repairs were made on flood control installations. At the same time a major effort was made to improve technical management, and the systems of "specialized management" and "mass management" were both used. Unified water allocation was undertaken; measures included the use of well irrigation in plains areas and pumping of reservoir water into mountain regions, and movement of excess water from the eastern part of the county to the western part. In addition, careful studies were made of meteorological, hydrological and soil characteristics affecting the efficiency of irrigation. A major effort was made to see that irrigation ditches were matched to reservoir capacities, that drainage was matched to irrigation, and that ground leveling activities were undertaken where they were most beneficial.

AUTHOR: Bai Caifeng [4101 1752 7685]

ORG: Jinghuiqu Management Office, Shaanxi

TITLE: "Jinghuiqu Institutes Scientific Management and Planned Water Use and Gradually Increases Irrigation Effectiveness"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 23-26, 8

ABSTRACT: The Jinghuiqu irrigation district, Shaanxi, is a semiarid region where water use efficiency is extremely important to agriculture. Careful surveys were made of irrigation quantities and timing for various crops and water availability, and a water allocation plan was drawn up on the basis of this information. Examples of the plan for certain organizations are provided. In order to increase irrigation efficiency, efforts were made to stagger crop schedules enough to spread out peak water demand, in addition to which unified management of all water sources was instituted. As a result, irrigated area has increased from 500,000 mu after Liberation to 1.355 million mu currently, per-mu grain yield has steadily been over 800 jin per mu, with 1979 figures as high as 1,056 jin per mu. In addition, water use efficiency increased from 0.43 to 0.53.

AUTHOR: Jing Yongtang [6855 3057 1016]

ORG: Scientific Research Institute of Water Conservancy and Hydroelectric Power

TITLE: "An Experimental Study of Water-Carrying Capacity of Tubular Downhill Culverts and their Downstream Energy Dissipation"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 9, 20 Sep 81 pp 48-57, inside back cover

ABSTRACT: Tubular culverts for downhill transport of irrigation water have many advantages over open square or stepped cross section culverts, and are coming to replace them in many irrigation areas of the world. Formulas for the water-carrying capacity of such tubular culverts are derived for cases in which the upper opening of the tube is not fully sumberged in water and in which it is fully submerged. Experimental studies were conducted to determine the actual flow characteristics of such tubes with different parameters; the results are presented in tables and graphs. In addition, a variety of designs for structures intended to dissipate the energy of the water at the lower exit of the tube were tested, and their characteristics are presented. The recommended design has a flow dividing fin at the lower outlet of the tube, followed by a barrier wall in the shape of a rounded W to dissipate the water flow energy.

8480
CSO: 4009/105

AUTHOR: CHEN Qinglian [7115 3237 3425]

ORG: Academy of Planning and Designing, Ministry of Water Conservation

TITLE: "Method of Sharing the Investment Cost of Water Conservation Construction of a Comprehensive Utilization Characteristic"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 pp 1-6

ABSTRACT: Water conservation construction is generally of a comprehensive utilization characteristic. Aside from flood prevention, irrigation, power generation, navigation, water supply, fishery, and tourism, many other departments of the national economy also reap benefits from the project. In the past, the capital was always appropriated from the national treasury and as compensation for investment was not required, the benefited departments bore no economic responsibility whatsoever. Each department tried to bring as much benefit as possible without ever considering the economical reasonableness. Under the influence of the ultra-leftist ideology, for a long time, politics count, economics does not. Following the discussion of the shortcomings of the old system of funding water conservancy projects, the author proceeds to propose the following methods of sharing the cost: (1) Proportional distribution of cost according to the yearly benefit received by the various departments; (2) Proportional distribution of cost according to the cost of

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 pp 1-6]

of equivalent project otherwise required by each of the benefited departments; (3) Prorated distribution according to certain indices, such as water usage or reservoir capacity; (4) Dividing the investment capital among all major departments to be benefited; (5) The separable costs-remaining benefits method, i.e. the SCRB method of sharing recommended by the USA; (6) Dividing the investment cost among various regions. Under each of the above methods, the technique of computation is introduced.

AUTHOR: XU Da [1776 6671]

ORG: Research Academy of Water Conservancy and Hydroelectric Power Science

TITLE: "National Symposium of Subterranean Drainage and Irrigation Technology for Farm Lands and the Technique of Improving the Saline and Alkaline Lands of Yanbei Prefecture"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 p 45

ABSTRACT: The Chinese Water Conservancy Society Farm Land Water Conservancy Specialty Committee and the Shanxi Provincial Water Conservancy Society jointly called the symposium in Datong City of Shanxi Province from 26 Aug to 1 Sep. There were 183 delegates attending and more than 70 papers were received. The subterranean drainage of farm land technique is reported to have been preliminarily extended in the 2 provinces of Jiangsu and Zhejiang, and experiments are being conducted in many other cities and provinces. According to incomplete statistics, construction for the technique has been completed for close to 5 million mu of fields. Subterranean pipes have also been laid in 3 million mu of fields for irrigation. It is hoped that reliable data will soon be available concerning the benefits of these techniques. Yanbei Prefecture of the Datong basin has rich ground water resources, but the soils have a high soda content and the yield is low and unstable. There remain 700 thousand mu of uncultivated wasteland. It is essential to replace the

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 p 45]

existing simple grain production system with a combined farming, forestry, and animal husbandry structure. Water conservancy measures, using open ditches, subterranean pipes, and wells to drain the fields and to utilize the ground water resources, are proposed. Unified leadership is considered important for coordinating all related departments and scientific and technological manpower to provide unified management for surface and ground water, for water distribution and control, and for irrigation and drainage.

6248
CSO: 4009/106

AUTHOR: CHEN Qinglian [7115 3237 3425]

ORG: Academy of Planning and Designing, Ministry of Water Conservation

TITLE: "Method of Sharing the Investment Cost of Water Conservation Construction of a Comprehensive Utilization Characteristic"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 pp 1-6

ABSTRACT: Water conservation construction is generally of a comprehensive utilization characteristic. Aside from flood prevention, irrigation, power generation, navigation, water supply, fishery, and tourism, many other departments of the national economy also reap benefits from the project. In the past, the capital was always appropriated from the national treasury and as compensation for investment was not required, the benefited departments bore no economic responsibility whatsoever. Each department tried to bring as much benefit as possible without ever considering the economical reasonableness. Under the influence of the ultra-leftist ideology, for a long time, politics count, economics does not. Following the discussion of the shortcomings of the old system of funding water conservancy projects, the author proceeds to propose the following methods of sharing the cost: (1) Proportional distribution of cost according to the yearly benefit received by the various departments; (2) Proportional distribution of cost according to the cost of

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 pp 1-6]

of equivalent project otherwise required by each of the benefited departments; (3) Prorated distribution according to certain indices, such as water usage or reservoir capacity; (4) Dividing the investment capital among all major departments to be benefited; (5) The separable costs-remaining benefits method, i.e. the SCRB method of sharing recommended by the USA; (6) Dividing the investment cost among various regions. Under each of the above methods, the technique of computation is introduced.

AUTHOR: XU Da [1776 6671]

ORG: Research Academy of Water Conservancy and Hydroelectric Power Science

TITLE: "National Symposium of Subterranean Drainage and Irrigation Technology for Farm Lands and the Technique of Improving the Saline and Alkaline Lands of Yanbei Prefecture"

SOURCE: Beijing SHUILI SHUIDIAN JISHU [WATER CONSERVATION AND HYDROELECTRIC POWER TECHNOLOGY] in Chinese No 10, 20 Oct 81 p 45

ABSTRACT: The Chinese Water Conservancy Society Farm Land Water Conservancy Specialty Committee and the Shanxi Provincial Water Conservancy Society jointly called the symposium in Datong City of Shanxi Province from 26 Aug to 1 Sep. There were 183 delegates attending and more than 70 papers were received. The subterranean drainage of farm land technique is reported to have been preliminarily extended in the 2 provinces of Jiangsu and Zhejiang, and experiments are being conducted in many other cities and provinces. According to incomplete statistics, construction for the technique has been completed for close to 5 million mu of fields. Subterranean pipes have also been laid in 3 million mu of fields for irrigation. It is hoped that reliable data will soon be available concerning the benefits of these techniques. Yanbei Prefecture of the Datong basin has rich ground water resources, but the soils have a high soda content and the yield is low and unstable. There remain 700 thousand mu of uncultivated wasteland. It is essential to replace the

[continuation of SHUILI SHUIDIAN JISHU No 10, 1981 p 45]

existing simple grain production system with a combined farming, forestry, and animal husbandry structure. Water conservancy measures, using open ditches, subterranean pipes, and wells to drain the fields and to utilize the ground water resources, are proposed. Unified leadership is considered important for coordinating all related departments and scientific and technological manpower to provide unified management for surface and ground water, for water distribution and control, and for irrigation and drainage.

6248
CSO: 4009/106

AUTHOR: WANG Fengyin [3769 7685 7892]

ORG: Huanglongtan Hydropower Plant

TITLE: "Analysis of the Causes of the Flooding Accident of the Powerhouse of the Huanglongtan Hydroelectric Power Station"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May p 3

ABSTRACT: The powerhouse of the Huanglongtan Hydroelectric Power Station situated in the northwestern mountain regions of Hubei Province was flooded at 0521 hours on 24 June 1980, causing a 9-hour power failure. Analysis blamed poor design, the inappropriate location of the site of the powerhouse and the lack of drainage and flood prevention measures. The power station was also not prepared in flood forecasting and flood prevention. Communications between the power station and meteorological and hydrological reporting stations relied solely on one telephone line. When the station was flooded, all communication links and power were cut off, and there was no emergency electrical power source. Without electricity, the sluice gates could not be operated. Design flaws in flood prevention were the main cause of the flooding accident at the Huanglongtan Hydroelectric Power Station.

AUTHOR: ZENG Pengjui [2582 7720 0036]

ORG: First Prospecting Team of the Northeast Surveying and Design Institute of the Ministry of Electric Power

TITLE: "Some Experience in Diamond Drilling"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May 81 p 17

ABSTRACT: Between December of 1979 and May of 1980, two diamond drills were used at the Datengxia prospecting site to drill 3,247 meters. They proved to be more efficient than steel drills. The diamond drills were especially suitable for drilling and extracting the soft mud band layer because they extracted 339 layers of mud bands ranging in thickness from 2 millimeters to 30 millimeters during the first half of 1980. This could not be done by steel drills. The drill heads of the diamond drill should be carefully selected. The drill head manufactured in Shanghai had 8 water spouts for cooling the drill head and washing away rock powder. Its useful life was twice that of the drill head with only 6 water spouts manufactured in Guilin. When drilling in fragmented rock formation and hard rock formation, abnormal wear increased. Two methods to protect the walls of the hole drilled were devised. One was to lower a casing pipe, the other was to seal the hole with cement of a water and lime ratio of 50 percent. Drilling in hard granules of quartz sandstone was difficult, but it was accomplished by drilling through the hard layer with a new diamond drill head.

AUTHOR: LIN Xiaonan [2651 5135 3948]

ORG: Fuchunjiang Hydroelectric Powerplant

TITLE: "Determining the Goal and Function of Comprehensive Automation of the Fuchunjiang Hydroelectric Power Station"

SOURCE: Beijing SHUILI FADIAN [WATER POWER] in Chinese, No 5, 12 May 81 p 42

ABSTRACT: Fuchunjiang Hydroelectric Power Station is a low waterhead runoff type power station with a reservoir capacity of 440 million cubic meters, 5 generators and a total installed capacity of 300,000 kilowatts. In computer applications at the hydroelectric power station, flood forecasting and operations control are important functions. Another assurance of the safe operation of the reservoir and station is timeliness and reliability of flooding reports of the reservoir area. In the past, such reports relied on telegraphic messages. During the flooding season, the runoff type power station generates electricity according to the amount of water flow, forcing the generators to simultaneously operate under full loads. To assure safe operation, it is hoped that computers can help perform tasks which humans cannot perform accurately, mainly prediction of mishaps, carefully monitoring relays, automatic equipment and switches. Analysis shows the use of a distributed system of computer stations to realize comprehensive automation of the whole powerplant can produce economic benefits with better efficiency and safer operation.

9296
CSO: 4009/454 END

JPRS 79658

14 December 1981

China Report

SCIENCE AND TECHNOLOGY

No. 140

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79658

14 December 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 140

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

First Symposium on Chemical Mineral Processing
(YOUSE JINSHU, No 4, 1981).................................... 1

Briefs

Tianjin Computers 3
Machine Tool Noise Level 3

ABSTRACTS

ARCHITECTURE

JIANZHU XUEBAO /ARCHITECTURAL JOURNAL/, No 10, 20 Oct 81............. 4

COAL

MEITAN XUEBAO /JOURNAL OF CHINA COAL SOCIETY/, No 3, 1981............ 7

ELECTRONICS

DIANZIXUE TONGXIN /JOURNAL OF ELECTRONICS/, No 4, 1981................ 8

ENGINEERING

TAIYUAN GONGXUEYUAN XUEBAO /JOURNAL OF TAIYUAN INSTITUTE OF
TECHNOLOGY/, No 3, 1981.. 13

IRON AND STEEL

GANGTIE /IRON AND STEEL/, No 10, 1981................................ 19

METROLOGY

JILIANG XUEBAO /ACTA METROLOGICA SINICA/, No 4, 22 Oct 81............ 22

NATURAL SCIENCES

BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN /ACTA SCIENTIARUM NATRUALIUM UNIVERSITATIS PEKINENSIS/, No 3, 1981............................... 28

PHYSICS

BANDAOTI XUEBAO /CHINESE JOURNAL OF SEMICONDUCTOR/, No 4, Nov 81...... 36

DIWEN WULI /ACTA PHYSICA TEMPERATURAE HUMILIS SINICA/, No 3, 1981..... 40

FIRST SYMPOSIUM ON CHEMICAL MINERAL PROCESSING

Beijing YOUSE JINSHU (NONFERROUS METALS) in Chinese No 4, 1981 pp 75-76

[Text] The First Symposium on Chemical Mineral Processing, sponsored by the Mineral Processing Institution, Chinese Society of Metals, was held on May 5-9, 1981, at Daye Nonferrous Metals Company, Hubei Province, China. At the Symposium were present 112 people, representing 64 organizations under the Ministry of Metallurgical Industry, Chinese Academy of Sciences, Second Ministry of Machine-Building Industry, Ministry of Geology and Ministry of Chemical Industry.

For the meeting were prepared 66 papers, which were all read out and discussed at the general or panel sessions respectively, In the meantime the attendants visited the Tonglushan concentrator and its pilot plant for chemical mineral processing. Seminars were organized for discussing the problems of beneficiation of Tonglushan oxide ores, some constructive suggestions being put forward.

At the symposium research results in the field of chemical ore treatment acquired since liberation were reviewed, and directions in its development in China in the years to come were discussed. All this should play a positive role in developing the research and practice of refractory ore beneficiation in China.

Some progress in chemical mineral processing can be drawn from the papers presented to the symposium as follows.

1. **Refractory oxidized copper ores** For treating these ores the process of segregation followed by flotation has been studied widely and intensively; experiments have been run on the ores from more than a dozen deposits, among which ores from four deposits subjected to pilot scale tests, and at Shilu copper mine, Guangdong Province, this process for treating oxidized copper ores has been in commercial operation for years. The technology of leaching-extraction-electrowinning, commercially used abroad, has also been studied and practiced at home, and a series of full scale and pilot scale experiment results achieved, thus having laid the foundation for its commercial application. The new technology of leaching-precipitation-carrier flotation, successfully tested recently, has been verified in continuous experiments. New progress has been made in biological leaching copper ores. SO_2 leaching under atmospheric pressure and room temperature, flotation of leached residue, hot water sulphidization-flotation, ammonia leaching-sulphidization-flotation and other processes have all been investigated by the organizations concerned.

2. Refractory complex ores Rough concentrates are produced by conventional beneficiation process from refractory ores containing W, and W,Ta, Nb, and qualified products yielded by hydrometallugical treatment of these concentrates. Co, Mn and Ni are recovered by $FeSO_4$ heap leaching the lean manganese nodules from lake bottom. Blast furnace pellets can be produced by double chloridizing roasting of complex limonite ores containing other metals, and the by-products such as Cu, Pb, Zn recovered as well. Selective chlorination of the same ores can recover the associated metals such as W, Cu, Pb, Zn, Bi, etc. as well as yield high-quality iron concentrate. The dithionate process for treating Ni-containing manganese ore, chloride or dithionate method for processing oxidized Pb-Zn ores were also described in some papers.

3. Uranium ore Chemical treatment has been one of the important methods for treating uranium ores for a long time. But in recent years new progress has been made in this field. For example, a new method of chemical treatment of uranium-and complex sulphides-containing carbonatites can recover U, Cu, Pb, Zn and other values.

4. Impurities removal from concentrates Chemical process for treating W, Sn and some rare metals rough concentrates to obtain products up to standard has long since been used in production. In some papers at the meeting were outlined some special methods of chemical treatment, such as reducing staining process for iron removal to upgrade Cr-concentrate,biological leaching high arsenic sulphide concentrate for arsenic removal,metallizing roasting process for treating refractory oolitic hematite ores,chemical process to treat P-containing manganese ore,etc.

5. Treatment of slag, dust, anode slime, effluent, rock and tailings Combined flowsheets of beneficiation and metallurgical process to treat wastes, such as slags of smelters and tailings from concentrators,have already been in commercial use in China. The examples include flotation of copper smelting slags to recover copper,beneficiation of artificial rutile, flotation of leached zinc residue to recover silver,flotation of anode slime,bacterial leaching of tailings to recover uranium and copper,etc.Progress has also been made in the combined technology to treat copper dust leaching residue, Mn-and Nb-containing slags,high calcareous coal ashes containing V,Mo and U,mine effluents and other waste materials.

At the symposium it was realized that our task in future is to develop the new technology of chemical mineral processing in accordance with the features of mineral resources in China and the requirements of their full utilization and environmental protection, and to put the more established processes into production as soon as possible.

However, it should be noted that most papers discussed at the meeting mainly involved laboratory testing results. Therefore, there must be every effort to bring them into production to achieve technically feasible and economically reasonable performance. That is the grave responsibility we should take upon ourselves.

CSO: 4008/34

BRIEFS

TIANJIN COMPUTERS--The North China Branch of the National Consumers' Association of (DGF)-100 computers was inaugurated in Tianjin 13 November under the auspices of the State Bureau of Computers and the Chinese Computer Service Company. Attending the ceremony were representatives of consumers, manufacturers, scientific institutes and universities in Hebei, Shanxi, Nei Monggol and Tianjin--totaling 100 persons. Model (DGF)-100 computers are small digital computers which are inexpensive, highly efficient, stable and reliable. They have many uses. [SK170600 Tianjin City Service in Mandarin 1430 GMT 14 Nov 81 SK]

MACHINE TOOL NOISE LEVEL--After a year of tests and making improvements, the laboratory of the research institute of the Kunming Machine Tool Plant has reduced the noise level of the T-68 machine tool from 83 to 79 decibels, making a leap onto the country's advanced level. Noise is an important indicator for judging the quality of a machine tool. Beginning last year, this laboratory in cooperation with the Kunming Institute of Engineering proceeded in manufacturing its own noise [measuring] machine, repeatedly studied the cause of noise produced by the T-68 machine tool, searched for methods of eliminating the noise, and collected large quantities of data. They also adopted measures to improve the processing techniques and cutting tools and succeeded in reducing the noise level. As a result of these measures taken, the quality of this reliable product has been further improved. This article was excerpted from JICHUANG GONGREN [MACHINE TOOL WORKER]. [Text] [Yunnan RUNNAN RIBAO in Chinese 20 Oct 81 p 1]

CSO: 4008/28

AUTHOR: None

ORG: Judging Committee

TITLE: "Nationwide Competition of Rural Dwelling Design"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 10, 20 Oct 81 p 1

TEXT OF ENGLISH ABSTRACT: A nationwide competition of rural dwelling design was jointly sponsored by the Office of Rural Building Development, the State Commission of Capital Construction and CAS in 1980-81. Throughout China 6500 designs were made, of which 142 were recommended by relevant authorities for competition. A meeting for judging these designs was held in Beijing in June 1981. Two designs from Sichuan and Tianjin respectively were awarded first prizes. Thirty designs won second prizes and there were 52 third prizes.

In many of the designs submitted, considerations were given to the use of land, the disposition of the courtyard and the arrangement of the building plan in order to facilitate rural life and sideline production. Local conditions regarding building materials and construction methods were noted. Local architectural styles, new sources of energy, such as marsh gas and sunlight, were considered in some of the winning designs.

AUTHOR: None

ORG: None

TITLE: "Seminar on 'The Changing Rural Habitat' to be Held in Beijing"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 10, 20 Oct 81 p 33

TEXT OF ENGLISH ABSTRACT: A seminar on "The Changing Rural Habitat" will be held in Beijing, 19-22 October, under the sponsorship of the Steering Committee of the Aga Khan Award for Architecture at the invitation of CAS. Among the 20 Chinese and 50 foreign scholars and specialists who will attend the seminar there will be architects, city planners, as well as artists, economists, historians and geologists. Mr and Mrs Aga Khan will be present at the seminar. An eight day visit to Xian and Xinjiang will be made after the meeting. Mr Aga Khan, Mrs Han Suyin and leaders of relevant Chinese institutions will speak at the seminar. In all, 12 papers, including three from China entitled "Rural Dwellings," "Utilization of Marsh Gas" and "Cave Dwellings," will be read. Pictures showing Chinese architecture will be exhibited.

AUTHOR: ZHOU Peinan [0719 1014 0589]
etc.

ORG: None

TITLE: "New Spaces Gained from Loess-land"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 10, 20 Oct 81 pp 34-40

TEXT OF ENGLISH ABSTRACT: With a long history in traditional building, the cave dwelling still plays an important role in present-day housing and tourism. The authors point out the following advantages of cave dwellings: 1. Overall consideration to dwelling and cultivation in land-use leads to the gain of more space. 2. Warm in winter and cool in summer, easily constructed and low in cost. 3. Incorporation of natural and man-made environments. Cave dwelling is an effective means of building in loess-lands and still has its vitality in serving present-day life under certain conditions by inheriting traditional experiences and making improvements and renovations.

Experiments have been conducted in Xingyang County, Henan Province, in regard to hillside cave dwellings with courtyards, which show the following characteristics: 1. More spacious both outdoors and indoors. Full utilization of earth and less cut-work by providing earthen stoves in the kitchens and earthen beds and tables

[Continuation of JIANZHU XUEBAO No 10, 20 Oct 81 pp 34-40]

in the living rooms. 2. Dwellings are built on the hillsides and face the water, providing a good environment. 3. All the rooms face the courtyard which offers a center for daily activities with separate quarters for fowls, pigs and latrines. Improvements have been made in lighting and ventilation by making both ends of the caves open.

AUTHOR: ZHANG Jinqiu [1728 6930 4428]

ORG: None

TITLE: "Mosque at Hua Jue Xiang, Xian"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 10, 20 Oct 81 pp 70-77

TEXT OF ENGLISH ABSTRACT: The erection of mosques in China started in the Tang Dynasty following the introduction of Mohammedanism. After the absorption and blending by Chinese artisans through the ages, mosques in China reached a mature architectural style in the Ming and Qing Dynasties, with distinctive Chinese characteristics. Generally Chinese mosques fall into two categories: those in the Xinjiang Uyghur Region and those in other provinces. The former style was much influenced by central Asiatic architecture, e.g., the Mosque at Kashi, and the latter keeps more traditional Chinese architectural features. The Mosque at Hua Jue Xiang, Xian, is the largest and best preserved example of the latter type. This mosque was first built in the 14th century, and was renovated in 1522, 1606 and 1974. The author analyzes the building with respect to plot plan, architectural style, courtyard disposition and decorative treatment. It has been found that the building satisfies all the requirements of the religious activities, on the one hand, and bears distinctive Chinese architectural features and characteristics on the other.

9717
CSO: 4009/125

Coal

AUTHOR: GAO Fengqi [7559 7685 1477]

ORG: Northeastern Normal University

TITLE: "Classification, Regionalization and Periodization of the Peat Deposits in Hebei Province"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 3, 1981 pp 34-43

TEXT OF ENGLISH ABSTRACT: The classification, regionalization and periodization of the peat deposits are described, taking the peat deposits in Hebei Province as an example. The classification of the peat deposits is based on the geomorphological types of peat occurrence, so as to make use of the geomorphological marks for mineral exploration. A classification system, including class, subclass, type and sub-type, is proposed. The peat deposits in Hebei Province are divided into four classes. The division of the regions is based on the leading peat-genetic types and the division of their occurrence by taking into consideration the geomorphological types and the dividing boundaries of the geomorphological region. The peat deposits may be classed into regions and sub-regions. The peat deposits in Hebei Province have been divided into five regions. Since the Late Upper Pleistocene period, the formation of the peat deposits in Hebei Province has been, on the whole, related to the fluctuation of the world's climate. They are divided into two periods, and subdivided into several sub-periods according to the difference in the formation of the peat deposits in different regions.

AUTHOR: JIANG Ben [1203 2609]
YANG Guixian [2799 2710 0103]
LIU Mingzhi [0491 2494 2535]

ORG: JIANG and YANG both of the Research Institute of Geology, Central Coal Mining Research Institute; LIU of Heshan Coal Mine Administration

TITLE: "Application of Physical Modeling in the Calculation of Hydrology in Coal Mines"

SOURCE: Beijing MEITAN XUEBAO [JOURNAL OF CHINA COAL SOCIETY] in Chinese No 3, 1981 pp 60-70

TEXT OF ENGLISH ABSTRACT: Coal deposits with water rushing from the floor through karst or fissures are widely distributed in China. The method for prediction of water inflows from the roadways of such kind of deposits by a physical model, mainly by mesh analogue, has been investigated. It mainly includes the setting up of the hydrological model for calculating the infiltration field and formulas for relevant parameters, the method for simulating the spatial laminar and turbulent flows of the water rushing point at the nodal of the plate mesh and simulating method for heterogeneity. Finally, the specific procedure and successful results of this modeling method are described with some examples.

9717
CSO: 4009/142

Electronics

AUTHOR: C.K. KWONG
REN Fangbin [0117 5364 2430]
ZHENG Yijia [6774 1837 0857]
QIU Yuhai [6726 5148 3189]
LI Guohua [2621 0948 5478]
et al.

ORG: KWONG of the School of Electrical Engineering, Sydney University; REN, ZHENG and QIU, et al., all of the Beijing Astronomical Observatory, Chinese Academy of Sciences; LI of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "Real Time Data Collection System and Two-dimensional Fourier Transform Hardware for Mi-Yun Meter-wave Aperture Synthesis Radiotelescope"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 201-212

TEXT OF ENGLISH ABSTRACT: In this paper, two pieces of equipment for Mi-Yun meter-wave aperture synthesis radiotelescope are described. These two pieces of equipment are used for data acquisition and handling with the on-line computer, NOVA-3/D.

The Mi-Yun aperture synthesis system consists of an E-W array, giving 192 simultaneous signal pairs of the form $R=W\cos\theta$, $I=W\sin\theta$ per 10 seconds, where W is

[Continuation of DIANZIXUE TONGXIN No 4, 1981 pp 201-212]

the fringe amplitude and $\theta = (2\pi d/\lambda)\cos\delta \sin \mathrm{HA}$, the phase ($d$--the interferometer spacing, λ--the wave length, δ--the declination and HA--the hour angle of field center).

The first equipment is the data collection system which performs the following functions:
1. In every 10 msec it generates a value, $\varphi_0 = A \sin HA$, where A is the carefully chosen constant and HA is the hour angle of the field center.
2. In the same 10 msec it generates φ_k, where $\varphi_k = k\varphi_0$ (k = 3, 4, ..., 194), accurate to 2°.
3. It converts each of the 192 signal pairs into parameters W_k and θ_k; performs the "fringe stopping" by subtracting φ_k from each θ_k, giving a new signal set of the form $W_k \cos(\theta_k - \varphi_k)$ and $W_k \sin(\theta_k - \varphi_k)$; accumulates for 10 seconds and sends the output data to the on-line computer.

The function $\varphi_0(t) = A \sin HA$ is generated by the digital differential analyzer (DDA) developed by one of the authors (C.K. Kwong).

AM-2901 has been used for the CPU of our system. A block diagram of the whole system is shown in the article, as is the flowchart of the microprogram. The system can work either with mean time or sidereal time.

[Continuation of DIANZIXUE TONGXIN No 4, 1981 pp 201-212]

The other equipment is the two-dimensional direct Fourier transform (DFT) hardware based on the previous work of R.H. Frater, adapted for the data handling of the Mi-Yun system.

The observation will be carried out in 12 hours, filling up 2160 equally spaced hour angles with 192 spacings each, thus 2160 x 192 grid values in the u-v plane (as defined in the article). The Fourier transform of this u-v distribution is to be performed by the DFT hardware to give a radio sky map on a 256 x 256 grid. The performance can be completed in less than six minutes.

In the construction, the principle and scheme developed by Frater has been used with some minor modifications, such as using the hardware multiplier (MPY-12 AJ) in place of the Log. table, increasing the accuracy with interpolations, etc. A block diagram of the DFT hardware is given. As a laboratory test, a set of signals simulating a point source located at the field center was sent to the DFT hardware. The result of the Fourier transform is shown, and agrees well with the estimate.

The two pieces of equipment have now been completed and have worked normally for several months.

AUTHOR: JIN Shengjing [6855 5110 4842]
SHEN Guoguang [3088 0948 0342]
GUO Hongde [6753 3163 1795]
et al.

ORG: All of Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "A High-speed High-accuracy A/D Converter"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 213-221

TEXT OF ENGLISH ABSTRACT: A high-speed high-accuracy partially-cascaded A/D converter is developed which is used with the telescope for observing the solar magnetic field. The major techniques employed for realizing high speed and high accuracy are discussed, and some related factors are also considered.

For this converter, the word length is 12 bits, the resolution power is 1 mV, the relative accuracy is less then 0.025 percent, and the rate is 100,000 sec^{-1} when a sampling hold circuit is cascaded in front of it.

AUTHOR: ZHOU Wenbiao [0719 2429 5903]
SONG Peide [1345 1014 1795]
SONG Wenmiao [1345 2429 8693]

ORG: All of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "The Theory and Calculation of Velocity Resynchronism of Helix Type TWT"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 222-226

TEXT OF ENGLISH ABSTRACT: In the first part, the working equations of velocity tapered TWT are deduced theoretically. This paper presents a computer program for TWT with double velocity jump and describes the calculated results and compares them with experimental data. The comparison shows that they are rather close. Therefore, this program can be used for the design and selection of the TWT with the double velocity jump.

AUTHOR: HE Qichao [0149 0366 6389]
XU Tingwei [1776 1694 0251]

ORG: Both of the Radio Electronics Department, Sichuan University

TITLE: "A New Method--The Monte Carlo Numerical Integration Method for Computing Collection-efficiency of an Electron Optical System"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 227-236

TEXT OF ENGLISH ABSTRACT: A new method that combines the Monte Carlo method with the numerical integration method used for computing electron trajectories in a vacuum to calculate the electron collection efficiency of the anode (or dynode) of an electron optical system is presented. This method can simulate the whole process of electron motion in a system. Taking the microchannel plate photomultiplier as an example, the collection efficiency is calculated, the influences of the distributions of electron emitting angles and energies are studied, and the limitation and extension of this method are discussed.

AUTHOR: GAO Mingtai [7559 6900 0669]
ZHAO Liping [6392 4539 1627]

ORG: Both of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "The Calculation of Heat Transfer of the Cathode Assembly in a Vidicon and the Design of Cathode Assembly with Small Power Dissipation"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 237-248

TEXT OF ENGLISH ABSTRACT: In this paper a model for calculation of heat transfer of the cathode assembly in vidicon is given. Five cathode assemblies with different constructions have been calculated by the computer. The calculated results prove the model is reasonable. In this paper, there are the following calculations: the temperatures at each part of the assembly; the heat radiation and conduction between different parts; the total power dissipation of the assembly and the influences of changing physical or geometrical parameters of the parts of the assembly on the total power dissipation. This paper is helpful in designing a new cathode assembly.

The design and experiment of the new cathode (Ba-Ni) assembly with small power dissipation are successful. The advantages of the new assembly are firm construction, easy assembly and quick heating (arriving at the operation temperature in a few seconds).

AUTHOR: GUO Hezhong [6753 0735 1807]
CHEN Zenggui [7115 1073 0964]

ORG: Both of the Institute of Electronics, Chinese Academy of Sciences

TITLE: "The Phase Condition of the Weibel Instability Gain Mechanism and a Wide Band Slow Wave Cyclotron Amplifier"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 249-253

TEXT OF ENGLISH ABSTRACT: Starting from the viewpoint of the coherent cyclotron radiation, we work out the phase condition of the Weibel instability gain mechanism and make a comparison with the phase condition of the cyclotron maser gain mechanism. In addition, we propose a conceived slow wave cyclotron amplifier (SWCA) with a periodic rf structure.

AUTHOR: MAO Zhongliang [5403 0022 5328]
REN Qunli [0117 5028 0500]

ORG: MAO of the Suzhou Railway Normal College; REN of the Yangzhou Post and Telegraph Office

TITLE: "Design Principles of 10,000 Chinese Character Radio Teletypewriter"

SOURCE: Beijing DIANZIXUE TONGXIN [JOURNAL OF ELECTRONICS] in Chinese No 4, 1981 pp 254-258

TEXT OF ENGLISH ABSTRACT: This article deals with the design of a 10,000 Chinese character radio teletypewriter based on Zhi's "Chinese character coding method." The teletypewriter consists of a receiver and a transmitter. The former is more important and it contains: (1) 10,000 Chinese characters' geometric distribution structure; (2) 10,000 Chinese characters' optional selection and typewriting method; (3) 5050-0000 code; (4) electronic calculation; (5) electronic calculation clock procedure; (6) 5050 code calculation circuit connection; (7) production of 0000-5050 code.

This teletypewriter adopts the direct character memory method, so no large-scale high density memory elements are required.

This teletypewriter not only can directly transmit Chinese characters, but also can

[Continuation of DIANZIXUE TONGXIN No 4, 1981 pp 254-258]

be connected to the national computer network to communicate with data centers. The data required can be typewritten in Chinese at the very moment they are received.

9717
CSO: 4009/114

AUTHOR: ZHANG Xiaoliang [1728 2400 5328]
MU Jinhu [4476 6855 5706]

ORG: Both of Taiyuan Institute of Technology

TITLE: "The Calculating Method for Prestressing Losses Caused by the Shrinkage and Creep of Prestressed Lightweight Concrete"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 1-11

TEXT OF ENGLISH ABSTRACT: A calculating method for prestressing losses caused by the shrinkage and creep of prestressed lightweight concrete is presented in this paper, along with the relative coefficients of effective calculating values. Tables containing recommended values for design are also given herein. The results of this study have been accepted in drafting the "Temporary Codes for the Design of Prestressed Lightweight Concrete Structures" of China.

AUTHOR: YANG Guitong [2799 2710 6639]
DING Shuren [0002 2885 0086]

ORG: Both of Taiyuan Institute of Technology

TITLE: "A Linearized Constitutive Equation of Rate Sensitive Materials under High Strain Rate Conditions and Its Application"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 12-20

TEXT OF ENGLISH ABSTRACT: In this paper, we investigate a linearized constitutive equation of rate sensitive materials under high strain rate conditions. Our analysis is based on the experimental results of Clark and Duwez (1950) and others. The new linearized constitutive equation is easier to use in engineering practice. A simple example is given at the end of the paper.

AUTHOR: XU Xia [1776 0204]
CHEN Guinan [7115 2710 2809]

ORG: XU of Taiyuan Institute of Technology; CHEN of Taiyuan Lathe Works No 1

TITLE: "The Development of Short Gear Chain Transmission Headstock of CT6140"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 21-30

TEXT OF ENGLISH ABSTRACT: CT6140 has been designed and produced based on an analysis of 214 kinds of foreign and Chinese lathes, and meets the "Chinese Regulations for All Types and Sizes of Lathes." The main characteristics of the headstock are: short gear-chain transmission, low noise, high efficiency and high vibration strength.

Through a series of tests by the Shaxi Machinery Department, the Shenyang Lathe Research Institute and over 30 other lathe units and factories, CT6410 has been accepted as well-qualified, with the noise of the headstock being 78 dB (A), cutting slot length 210 mm, idling power 1.62 kw (with change gears but no feed), and cutting moment being 25 percent greater than the standard one, steady with no vibration.

AUTHOR: WANG Keming [3769 0344 2494]

ORG: Taiyuan Institute of Technology

TITLE: "Research on the Ignition System of the Double Cam Distributor in a Rotor Engine"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 31-38

TEXT OF ENGLISH ABSTRACT: This article introduces the ignition system of the double cam distributor used in the middle-sized rotor engine. In the article the circuit arrangement of the ignition system as well as structures of the double cam distributor and specially-made ignition coil with two ends, and the theoretical ground for the series ignition are briefly described and are compared with the usual ignition systems in China and abroad.

AUTHOR: GUAN Yuxiang [7070 3768 4382]
ZHANG Rongrui [1728 2837 3843]

ORG: Both of Taiyuan Institute of Technology

TITLE: "The Matrix Calculating Method of the Spatial Mechanism Position and Its Errors"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 39-52

TEXT OF ENGLISH ABSTRACT: Based on reference material, this paper introduces the fundamental equation for determining the errors of spatial mechanisms in geometric parameters (lengths, rotation angles, etc.) by using the matrix differentiation method combined with the practical application of robot manipulators to calculate the position of the spatial mechanism and its errors.

AUTHOR: LIANG Zhilin [2733 1807 7207]
SHE Xiaodong [0152 2556 2639]

ORG: LIANG of the Department of Mechanical Engineering, Taiyuan Institute of Technology; SHE of the Taihang Meter Factory

TITLE: "Research on the Pit Skin Defect of Aluminum Alloy Investment Castings"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 53-60

TEXT OF ENGLISH ABSTRACT: Based on productive practice, in this paper the pit skin defect of aluminum alloy investment castings is investigated, various factors affecting the defect are examined, and defect formation mechanism is fairly deeply explored. In addition, some technical steps for eliminating the defect are presented.

AUTHOR: ZHANG Hongmin [1728 1347 3046]
YANG Yuyong [2799 5148 0516]
SUN Jue [1327 3778]
YANG Lijiu [2799 4409 3061]

ORG: ZHANG, YANG Yuyong and SUN all of the Taiyuan Institute of Technology; YANG Lijiu of the Shanghai Lathe Institute

TITLE: "The Finite Element Calculation of the Spoke-like Transducer"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 61-71

TEXT OF ENGLISH ABSTRACT: The application of the new spoke-like transducer has been widely adopted recently, having the advantages of low height, broad measuring range, high accuracy, good linearity, etc. In order to determine its dimensions properly and reasonably and to provide a dependable basis of design, the stress and vertical displacement of the spoke of the transducer are calculated and analyzed with a three-dimensional finite element method. An attempt is made to treat this problem as a two-dimensional one. Several two-dimensional models are considered and the results thus obtained are compared with those of the three-dimensional model.

AUTHOR: WANG Jinbao [3769 6651 1405]

ORG: Taiyuan Institute of Technology

TITLE: "Law of Groundwater Storage in Loess Soil Distribution Area"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 72-86

TEXT OF ENGLISH ABSTRACT: The loess soil distribution area is composed of "two-element structure" in which the overlying stratum is loess soil, and the underlying one is Quaternary Low-Pleistocene and antediluvial stratum. The former is heterogeneous containing crack-interstitial water aquifuge, and the latter can be composed of good water-bearing structure under certain conditions.

According to the point of view of geomechanics, the law of the occurrence and distribution of the loess soil area ground water is subject to the function of water controlling the behavior and of that of rock beds.

This paper discusses the water-controlling characteristics in loess soil distribution area in seven respects. According to the distributed geomorphological and water-bearing features, five types of ground water in loess soil distribution area are classified.

AUTHOR: LIU Xingda [0491 2502 6671]

ORG: Taiyuan Institute of Technology

TITLE: "The Commutatorless Motor with Silicon Controlled Rectifier and Its Field Harmonics and Torque Ripples"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 87-95

TEXT OF ENGLISH ABSTRACT: Commutatorless motors are referred to as a new kind of electric machine recently developed. In this paper, some different types and constructions of the new electric machines arising in the world are first introduced, and then some additional problems appearing in the synchronous motors supplied with the silicon controlled source are discussed, including those occurring in field harmonics and torque ripples. The characteristics, effects and the methods for overcoming the defects are consequently analyzed.

AUTHOR: MA Zhiyi [7456 1807 3015]

ORG: Taiyuan Institute of Technology

TITLE: "The Effects and Inhibition of Nitrifying Action of BOD Test"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 96-101

TEXT OF ENGLISH ABSTRACT: In this paper, two steps in the process of biochemical oxygen demand and the effects produced by nitrification are discussed. Then, a detailed introduction to various methods of inhibiting nitrification, including the methods of disinfection and chemical inhibition, is given. Of these, the most effective method is the addition of chemical agents of ammonium chloride and TCMP. The author proposes that the inhibition of nitrification must be considered as a regular step in the BOD test, and that a unified national standard method of analysis must be established as soon as possible.

AUTHOR: ZHAO Xihuan [6392 6007 1403]

ORG: Taiyuan Institute of Technology

TITLE: "A Review of the Development of the SHPB Apparatus"

SOURCE: Taiyuan TAIYUAN GONGXUEYUAN XUEBAO [JOURNAL OF TAIYUAN INSTITUTE OF TECHNOLOGY] in Chinese No 3, 1981 pp 102-113

TEXT OF ENGLISH ABSTRACT: The development of the SHPB apparatus is reviewed in this paper in which the theoretical foundation of the SHPB apparatus and its difficulties in experiments and measurements are discussed.

9717
CSO: 4009/118

Iron and Steel

AUTHOR: ZHANG Shutang [1728 2885 1016]
LI Xiaoyu [2621 1420 3768]
XIA Dairun [1115 0108 3387]

ORG: All of the Central Iron and Steel Research Institute

TITLE: "Study of Flatness while Rolling Ultra Foils"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 1-5

TEXT OF ENGLISH ABSTRACT: In rolling different kinds of metal and alloy foils of thickness smaller than 0.01 mm with multi-high mill, orange peel-like ripples easily appear on the whole surface of the foil and it becomes very uneven. The influence of principal technological factors, such as front tension, total reduction, quality of foil edge, surface roughness and material of rolls, etc., on the orange peel-like ripples has been studied. At the same time, the form of deformation zone, the elongation along the width of foil, texture and stress, etc., have been measured. It is pointed out that the orange peel-like ripples are caused by inhomogeneous stress spread all over the whole foil surface during deformation. These inhomogeneous stresses originate mainly from the roll with rough surface and anisotropic deformation of grains in foil. Due to the minor ability of the ultra thin foil to resist the bending stress, the orange peel-like ripples easily appear on the surface of foil, even under very little stress. Experiments show that by adopting rational technology, it is possible to eliminate the orange peel-like ripples and obtain even ultra thin foil.

AUTHOR: CHEN Zhentao [7115 2182 7290]
YANG Jie [2799 4634]
LIU Xiaoping [0491 1420 1627]
HE Yuxin [6320 3022 6580]

ORG: CHEN of the Institute of Iron and Steel Research, AIS Company; YANG of Wuhan Iron and Steel Institute; LIU of Shoudu Iron and Steel Company; HE of the Beijing University of Iron and Steel Technology

TITLE: "Experimental Study of Outer Zones' Effect for Cold Strip Rolling"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 6-10

TEXT OF ENGLISH ABSTRACT: In order to increase the precision of the roll-force models for cold strip-rolling, the outer zones' effect is studied. The results of the tests show that the outer zones have a greater influence when ε is smaller and this effect is not obvious when $\varepsilon > 10$-15 percent. The influence increases with increasing initial thickness. Therefore, this factor must be considered when calculating roll force under certain conditions. The results of the test are in complete agreement with plastic mechanics.

AUTHOR: WANG Guodong [3769 0948 2767]
ZHANG Shutang [1728 2885 1016]

ORG: Both of the Central Iron and Steel Research Institute

TITLE: "The Strip Shape Equation and Its Application"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 11-17

TEXT OF ENGLISH ABSTRACT: The strip shape equation is one of the fundamental equations which describes the process of tandem cold rolling, but an accurate quantitative expression has not been given to the present time. Based on the elastic deformation analysis of rolls, a quantitative expression of the strip shape equation

$$\alpha + \beta p_c + \gamma p_e + \delta F_w - (h_c - h_e)/2 = 0$$

is deduced in this paper. The physical meaning of the coefficients $\alpha.\beta.\gamma.\delta$ is discussed, and the method of defining them is given. The strip shape equation can be used for analyzing synthetical characteristics of a tandem cold rolling mill, the direct calculation of the optimum roll bending jack force, the estimation of roll crowns and the adoptive correction calculation of the optimum roll bending fack force. As an example of the application, a direct method for calculating the optimum roll bending jack force is given. This method is simpler and more accurate.

AUTHOR: LU Yuqiu [4151 0060 6633]
WANG Xianjin [3769 0341 6651]
YE Yusheng [5509 3768 3932]

ORG: All of Beijing University of Iron and Steel Technology

TITLE: "An Experimental Study on Continuous Tube Rolling Process with a Controlled Mandrel"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 18-23

TEXT OF ENGLISH ABSTRACT: The continuous tube rolling process with a controlled mandrel is a new method of hot rolling of tubes. It has been experimentally studied at the mills' laboratories. It is shown that the mean total pressure on the rolls and the mean specific pressure on the mandrel in the tube rolling process with controlled mandrel are much less than those with a floating mandrel. In the former process the accuracy of tube diameter will increase effectively. The influence of the different distribution of elongation on the accuracy to tube wall thickness has been indicated. The investigation of the technological performance of four kinds of lubricants and the experiment with the mandrel made up of several parts with varied taper have been carried out and some positive results have been obtained. Based on the experimental study, it has been suggested that the adoption of the 3-4 stands tube rolling process with controlled mandrel will transform the small-scale plug mill set.

AUTHOR: YIN Guomao [3009 0948 5399]
WANG Dianhou [3769 3013 0624]
XIA Shanghua [1115 1424 5478]

ORG: All of Chengdu Seamless Steel Tube Factory

TITLE: "Study of a New Technology for Cold Rolled Non-magnetic Stainless Steel Tube with High Strength"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 24-30

TEXT OF ENGLISH ABSTRACT: This paper describes a new technology which strengthens the stainless tube steel 2Cr18Ni11Ti and 1Cr18Ni9Ti by cold deformation and thermal treatment. It shows that the yield strength of both steels exceeds 60 kg/mm^2 and 50 kg/mm^2 respectively, the intergranular corrosion resistance is considerably increased, and other properties, such as magnetic conductibility and ductility, are also improved. By adopting the new technology, 50 percent of raw materials and 50 percent of machining time may be saved and, consequently, the cost will be considerably reduced. This new technology is an important way to improve the properties of materials produced and to exploit the potentiality of material utilization.

AUTHOR: HUANG Xinfeng [7806 1800 1496]

ORG: Chongqing Special Steel Works

TITLE: "Production of the Composite Roll with High Ni-Cr-Mo Alloy Chilled Cast Iron Case and Spheroidal Graphite Iron Core"

SOURCE: Beijing GANGTIE [IRON AND STEEL] in Chinese No 10, 1981 pp 31-37

TEXT OF ENGLISH ABSTRACT: This paper surveys a description of the technological features of the washing process which is adopted to eliminate the severe foundry defects of the composite rolls with high Ni-Cr-Mo alloy chilled cast iron case and spheroidal graphite iron core. In practice, the carbon content of the outer layer is limited to a lower percentage, and proper quantity of magnesium is added so as to employ an iron of higher silicon content. The pouring process is also improved, increasing the early solidification layer thickness outside of the roll. In addition, high silicon spheroidal graphite iron is used as the material washing the roll core. By adopting the above process, one can effectively prevent the formation of hot tears, microflaw, gass bubbles in rolls, and the problem of insufficiency of depth of chilled structure is solved thoroughly. The rate of qualified cast is raised to over 91 percent, hardness of roll surface is HS 75-85, and the consumption of the roll is 2-3 kg/t when a 2.5-8 mm thickness steel plate (therein, 2/3 thin plate; 1/3 - 1/2 alloy steel plate) is rolled. Theoretical analysis on the prominent effect achieved is also described in this paper.

9717
CSO: 4009/135

AUTHOR: LI Xumo [2621 6070 6206]
ZHANG Jinde [1728 6930 1795]
SU Jinrong [5685 6855 2837]
et al.

ORG: LI, ZHANG and SU all of the Chinese Metrological Sciences Research Institute; et al.

TITLE: "A New Type of High Temperature Platinum Resistance Thermometer"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 243-252

TEXT OF ENGLISH ABSTRACT: A new type of high temperature platinum resistance thermometer has been developed and tested for use as an interpolation instrument for the International Practical Temperature Scale in the temperature range from 630.74 to 1064.43°C instead of the platinum/10 percent rhodium-platinum thermocouple. We have constructed more than 60 thermometers, which have a nomal resistance of 0.25 ohms at 0°C and have strip-shaped supports with notches. The construction of the thermometer is designed in such a way that the curvature of the platinum wire in a sensor keeps almost constant, and the strain in the wire can be decreased to the smallest amount.

The tests, which lasted for two years, show that the stability of the thermometer

[Continuation of JILIANG XUEBAO No 4, 22 Oct 81 pp 243-252]

is excellent. The average change in resistance of 10 thermometers at 0°C is 1.3 mK for every 100 hours during heating at temperatures from 1070 to 1100°C, and the average change of 5 better thermometers is 0.9 mK. The annealing time at 1100°C for achieving this stability is as short as 150 hours, which is much less than that reported in previous publications. Generally, the change of R_0 after high temperature quenching is no more than 1 mK. The insulation resistance of these thermometers at 1064°C is not less than 27 MΩ.

The problem of fused silica devitrification seems to be solved and very slight devitrification existed on the surface of the thermometer sheath, which had been exposed to the temperature of 1070°C for 952 hours.

AUTHOR: AN Ting

ORG: None

TITLE: "30 MHz Waveguide Beyond Cut-off Attenuator Standard Built in NIM"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 253-261

TEXT OF ENGLISH ABSTRACT: This paper describes the main characteristics of the 30 MHz WBCO attenuator standard and the calibration system. Error analysis and experiment results show that the accuracy of the WBCO is better than $\pm(5 \times 10^{-5} A + 0.0002)$ dB in the linear section, and the uncertainty of the calibration system is less than $\pm(1\sim2) \times 10^{-4} A$ in a range of 0~100 dB, where A is the measured attenuation in dB.

AUTHOR: CHEN Xiaju
et al.

ORG: None

TITLE: "The Standard of Visual Diffuse Transmission Density"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 262-267

TEXT OF ENGLISH ABSTRACT: This paper describes a standard apparatus of visual diffuse transmission density. It consists of a integrating sphere which is illuminated by a source with 3000 K color temperature, and a silicon photodiode with $V(\lambda)$ filters, as well as a digital display system with current-voltage converter. Its reproducibility is ±0.002 D, and the uncertainty is ±0.005 D. The comparison between it and the standard density tablet of other countries shows a good agreement for the density values. It shows that, therefore, the same diffuse transmission density value can be obtained with different methods, as long as the geometric and spectral conditions of density conform to the recommendation of the ISO.

AUTHOR: SONG Hongen [1345 7703 1869]

ORG: Beijing Optical Instruments Plant

TITLE: "The Relationship between Mechanical and Electrical Systems of Electronic Balance and Its Engineering Design"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 268-278

TEXT OF ENGLISH ABSTRACT: In this paper the relationship between mechanical and electrical systems of electronic balance are systematically discussed based on the theory of automatic-control. A simple and practical method for the engineering design of an electronic balance in closed loop is described and an example is given.

AUTHOR: CAI Lijun [5591 4409 0689]

ORG: Beijing Institute of Aeronautics and Astronautics

TITLE: "Analysis on Dynamic Response of the Cutting Dynamometer"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 279-288

TEXT OF ENGLISH ABSTRACT: Based on the dynamic characteristics, this paper deals with various dynamic error responses and relationships among various parameters in design of a dynamometer, and derives some formulas for the amplitude error and frequency bandwidth, the residual deviation, the optimum damping ratio, etc. In this paper, the theoretical basis and practical calculating methods for the design of the cutting dynamometer are also given.

AUTHOR: JIN Shizeng [6855 0013 1073]
TANG Junwu [0781 0193 2976]

ORG: Both of the Beijing Institute of Iron and Steel Technology

TITLE: "Research on the Stress Field of a Shear Load Cell with Photoelastic Method"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 289-294

TEXT OF ENGLISH ABSTRACT: This paper describes the experimental research of the stress field on a shear load cell with the photoelastic method. The results obtained are helpful in determining the optimum structure and improving the precision of the load cells.

AUTHOR: ZHAO Yinghai [6392 5391 3189]
WANG Zihe [3769 5261 0735]

ORG: ZHAO of the Hebei Metrology Management Bureau; WANG of the Chinese Metrological Sciences Research Institute

TITLE: "On the Temperature Correction of the Volume of Standard Containers"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 295-302

TEXT OF ENGLISH ABSTRACT: In the volume-temperature corrections for the standard container, the temperature of the liquid inside the container is usually used as that of the standard container, while the influence of the environmental temperature is neglected. In this paper, an analytic solution of the thermal strain and the temperature distribution is derived from the theory on the thermal stress, the effect of which is taken into consideration. The formulas of the temperature corrections under various conditions are given and their accuracies are evaluated.

AUTHOR: ZHU Dingming

ORG: None

TITLE: "Correction to Bowersox' Step Approach to the Dynamic Calibration of Transducers"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 303-310

TEXT OF ENGLISH ABSTRACT: Considering the difference between the ideal pressure step signal and a practical one from a real shock tube during the dynamic calibration of the transducers, a correction to the Bowersox step approach for calculating the frequency characteristics from time characteristics is presented in this paper. According to the approximative mathematical model, the correction equations are derived by the δ function. The correction methods and equations can be used for dynamic and quasi-static calibrations of pressure, force and other transducers in transient excited methods of step or ramp function inputs.

AUTHOR: LIU Yuzhao [0491 3768 3564]
BA Enxu [1572 1869 2485]
GUAN Xin'an [7070 0207 1344]
LIU Zhiguo [0491 1807 0948]

ORG: All of Nankai University

TITLE: "Frequency Stabilized by the Dip Due to Competition of Magnetic Polarization Modes"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 311-315

TEXT OF ENGLISH ABSTRACT: This paper gives the principle of frequency stabilized by means of the dip due to competition of magnetic polarization modes. The experiment shows that the ratio of the dip depth of the magnetic polarization mode competition to the corresponding output can approach 1:1. A good frequency stability is still obtained even if the detecting decreases to 0.02 volts.

AUTHOR: HU Yanrui

ORG: None

TITLE: "Characteristics of the Combination-type Standard Cells"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese No 4, 22 Oct 81 pp 316-320

TEXT OF ENGLISH ABSTRACT: Through the precise measurements for the combination-type standard cells made by two manufacturers, the EMF-temperature relations of (P+P-C), (S+P-C) and (B+B+S+S+S+SP) cells in a temperature range of 0-40°C and of (S+B) and (S+S+S+SP+SP) cells in a range of 15-40°C have been discovered. Temperature ranges of maximum EMF value of some cells are also found. There hysteretic effect, annual change, EMF reproducibility after temperature cycles and inner resistance have been studied. It is also found that the characteristics of the combination-type cells depend on the characteristics of each composite cell. The best one is the (P+P-C) cell, and its annual change is the smallest. However, the characteristics of the combination-type standard cells with the bismuth cell are the worst.

9717
CSO: 4009/111

AUTHOR: ZHUANG Dawei [5445 1129 5588]

ORG: Department of Mathematics, Beijing University

TITLE: "On Solving a Class of Nonlinear Evolution Equations"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 1-18

TEXT OF ENGLISH ABSTRACT: In a previous article we obtained a class of nonlinear evolution equations associated with the eigenvalue problem

$$\varphi_x = R\varphi,\quad R = \begin{pmatrix} -i\xi^2 & \xi q \\ \xi r & i\xi \end{pmatrix},\quad \varphi = \begin{pmatrix} \varphi_1 \\ \varphi_2 \end{pmatrix},$$

i.e.,

$$\begin{pmatrix} q_t \\ r_t \end{pmatrix} = D\left(\sum_{j=0}^{n-1} \alpha_{nj}(t) L^{n-j-1}\right)\begin{pmatrix} q \\ r \end{pmatrix},$$

[Continuation of BEIJINGDAXUE XUEBAO ZIRAN DEXUEBAN No 3, 1981 pp 1-18]

where

$$L = \begin{pmatrix} -\frac{D}{2i} + \frac{1}{2}qD^{-1}rD & \frac{1}{2}qD^{-1}qD \\ \frac{1}{2}rD^{-1}rD & \frac{D}{2i} + \frac{1}{2}rD^{-1}qD \end{pmatrix},\quad D = \frac{\partial}{\partial x},\ DD^{-1} = DD^{-1} = 1,$$

In this paper we point out that these equations can be solved by inverse scattering transformation method when q, r are not compact.

AUTHOR: WEN Guochun [5113 0948 2797]
DAI Zhongwei [2071 0022 4850]

ORG: Both of the Department of Mathematics

TITLE: "The Oblique Derivative Boundary Value Problem for Elliptic Complex Equation of First Order in a Multiply-connected Domain"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 19-29

TEXT OF ENGLISH ABSTRACT: In this paper we discuss the oblique derivative boundary value problem in an N+1-connected domain G for the nonlinear uniformly elliptic complex equation of first order in the plane:
(1) $W_{\bar z} = F(z, W, W_z)$, $F(z, W, W_z) = Q_1(z, W, W_z)W_z + Q_2(z, W, W_z)\overline{W_{\bar z}} + A_1(z, W)W + A_2(z, W)\overline{W} + A_3(z, W)$. For the sake of convenience, let G be a circular domain in the unit disc $|z| < 1$ which is bounded by N+1 circles Γ_j: $|z-z_j| = r_j$ $(j = 0, 1, \ldots, N)$, and Γ_0: $|z| = 1$, $z = 0 \in G$.

Suppose that Equation (1) satisfied condition C:
1) Function $F(z, W, U)$ is continuous for $z \in \bar G$, $W \in E$ (the whole plane), $U \in E$ and possesses the generalized derivative of first order for $z \in G$, $W \in E$, $U \in E$, and F_W, $F_{\bar W}$, F_z satisfy inequalities:

[Continuation of BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN No 3, 1981 pp 19-29]

$$(2)\quad \|F_W\|_{L_p(\bar G)} \leqslant K_0,\ \|F_{\bar W}\|_{L_p(\bar G)} \leqslant \varepsilon K_0,\ \|F_z\|_{L_p(\bar G)} \leqslant K_0,$$

$$(3)\quad |F(z_1, W_1, U_1) - F(z_2, W_2, U_2)| \leqslant K_0|z_1 - z_2|^\alpha + \varepsilon K_0|W_1 - W_2|^\alpha + q_0|U_1 - U_2|,$$
$$|F[1, W(1), W_z(1)]| \leqslant K_0,$$

where p (>2), α $(0<\alpha<1)$, K_0 $(0<K_0<\infty)$, ε $(0<\varepsilon\leq 1)$, q_0 $(0\leq q_0<1)$ are all constants.
2) Equation (1) satisfies the uniformly elliptic condition, i.e.,
(4) $|F_U| + |F_{\bar U}| \leq q_0 < 1$,
for almost every point of $z \in G$, where q_0 is a constant.

Problem P Find the continuously differentiable solution W(z) for Equation (1) in $\bar G$ such that it satisfies the oblique derivative boundary condition:

$$(5)\quad \mathrm{Re}[\overline{\lambda(z)}W_z + s(z)W(z)] = r(z),\ z \in \Gamma,\ W(1) = 0,$$

where

$$|\lambda(z)| = 1,\ C_\nu[\lambda(z), \Gamma] \leqslant l_0,\ C_\nu[s(z), \Gamma] \leqslant \varepsilon l_0,\ C_\nu[r(z), \Gamma] \leqslant l_0,$$

in which $\nu(\frac{1}{2} < \nu \leqslant 1)$, l_0 $(0 < l_0 < \infty)$ are two constants.

When $K = \frac{1}{2\pi}\Delta_\Gamma \arg\lambda(z) \geqslant N$, we also assume that W_z satisfies 2K-N+1 conditions.

Problem P of Equation (1) in the unit disc G was considered by I.I. Daniliuk and Fang Ainong.

[Continuation of BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN No 3, 1981 pp 19-29]

In this paper we establish the equivalence theorem, give the expression and estimate for the solutions of Problem P and then use the Schauder fixed-point theorem to prove the solvability for Problem P of Equation (1) in the N+1-connected domain.

Theorem Let the nonlinear equation (1) of first order satisfy the condition C, and if ε in (2), (3) is sufficiently small, then
1) When $K \geq N$, Problem P of Equation (1) has 2N solvable conditions;
2) When $K \leq 0$, Problem P has 3N-2K-1 solvable conditions;
3) When $0 \leq K < N$, the total number of solvable conditions for Problem P is not greater than 3N-K.

In addition, by using Fredholm's theorem of integral equations, we also discuss the solvability of the oblique derivative boundary value problem for linear uniformly elliptic complex equations in the N+1-connected domain.

AUTHOR: CHEN Jiading [7115 1367 7844]

ORG: Department of Mathematics

TITLE: "On the Minimax Method for the Truncated Life Test with Fixed Time"

SOURCE: Beijing BEIJING DAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 30-39

TEXT OF ENGLISH ABSTRACT: Let F(x) be a life distribution with density function f(x) (F(0)=0), and T be a fixed positive number ($0 < T \leq \infty$). Suppose that $F(t) < 1$ for all $t \in [0, T)$, and the failure rate function $r(t) \overset{\Delta}{\equiv} \frac{f(t)}{1-F(t)}$ is increasing on [0, T). Then a life test of (n, T) type is defined as follows: We select n specimens randomly from a population with distribution F(x), and begin the testing for n specimens at the same time. The stopping time of the test is min $(X_n^{(n)}T)$, $X_n^{(n)} = \max(X_1, \ldots, X_n)$ and $X_1, \ldots, X_n$ are the lives of n specimens respectively. Thus we can get data $X_1^{(n)}, \ldots, X_{\tau_n}^{(n)}$ from the test, where $X_1^{(n)}, \ldots, X_n^{(n)}$ are order statistics ($X_0^{(n)} \overset{\Delta}{\equiv} 0$) and τ_n is defined as

$$\tau_n = \begin{cases} \max\{i : 1 \leqslant i \leqslant n,\ X_i^{(n)} < T\}, & \text{if } X_1^{(n)} < T. \\ 0, & \text{if } X_1^{(n)} \geqslant T. \end{cases}$$

[Continuation of BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN No 3, 1981 pp 30-39]

The estimate $\hat{r}_n(t)$ for r(t) based on a so-called minimax method is the following:

If $X_1^{(n)} \geq T$, set $\hat{r}_n(t) \equiv 0$,
If $X_1^{(n)} < T$, set $\hat{r}_n(t) = r_n(Z_i)$ $(t \in [Z_i, Z_{i+1}))$ $(i = 0, 1, 2, \ldots, d)$, where $Z_1, Z_2, \ldots, Z_d$ $(Z_0 = 0 < Z_1 < \ldots \quad Z_{d+1} = T)$ are the different numbers among $X_1^{(n)}, \ldots, X_n^{(n)}$, and

$$\hat{r}_n(Z_q) = \mathop{\mathrm{Min}}_{d+1 \geq v \geq q+1,} \mathop{\mathrm{Max}}_{0 \leq u \leq q} \left\{ \frac{v-u}{S_n(Z_u, Z_v)} \right\}$$

$$S_n(Z_u, Z_v) = \sum_{i=u+1}^{v} (Z_i - Z_u) + (n-v)(Z_v - Z_u).$$

The estimate $\hat{R}_n(t)$ for the reliability $R(t) \overset{\Delta}{\equiv} 1\text{-}F(t)$ can be represented as

$$\hat{R}_n(t) = \mathrm{Exp}\left\{ -\int_0^t \hat{r}_n(x)\,dx \right\}$$

In the present paper, the following main theorem is proved:
Let $X_1, X_2, \ldots$ be mutually independent random variables on a complete probability space (Ω, F, P) which have a common distribution function F(t) with increasing

[Continuation of BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN No 3, 1981 pp 30-39]

failure rate r(t), then we have the following conclusions:
1) If t is a continuous point of r(x), $t \in (0, T)$, then

$$P\{\lim_{n \to \infty} \hat{r}_n(t) = r(t)\} = 1$$

2) If r(t) is continuous on (a, b) $(0<a<b<T)$, and a, b are both continuous points of r(t), then

$$P\{\lim_{n \to \infty} \sup_{a<t<b} |\hat{r}_n(t) - r(t)| = 0\} = 1$$

3) If $b \in (0, T)$, then

$$P\{\lim_{n \to \infty} \sup_{0<t<b} |\hat{R}_n(t) - R(t)| = 0\} = 1$$

where R(t) = 1-F(t).

AUTHOR: ZHANG Jinyan [1728 6930 3508]

ORG: Department of Mathematics

TITLE: "Loss of Stability and Bifurcation (Dimension 2)"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 40-42

TEXT OF ENGLISH ABSTRACT: The relationship between bifurcation and loss of stability is established as the following theorem:

Consider the system

$$\begin{cases} \dot{x} = P(x,y,\lambda) \\ \dot{y} = Q(x,y,\lambda) \end{cases} \qquad (1)_\lambda$$

where P and Q are analytic. If the origin (0, 0) is a stable (unstable) focus of center type of the system $(1)_0$, and unstable (stable) focus of the system $(1)_\lambda$ with $\lambda > 0$, then for the system $(1)_\lambda$ with sufficiently small $\lambda > 0$, there exists at least one stable (unstable) limit cycle in the neighborhood of (0, 0).

AUTHOR: YANG Fuqing [2799 5346 3237]
JIN Dexin [6855 1795 9515]
ZOU Yue [6760 1878]
ZHU Huizhen [2612 1979 4176]
SU Weizhen [5685 3262 3791]

ORG: YANG, ZOU, ZHU and SU all of the Department of Computer Science and Technology, Beijing University; JIN of the Shanghai Computer Factory

TITLE: "On the Design and Implementation of a Modular Operating System"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 43-46

TEXT OF ENGLISH ABSTRACT: In this paper some problems, including structural design, resource management, path communication and system description, are presented. It is noted that these problems should be taken into consideration in the design and implementation of a modular operating system.

AUTHOR: YANG Fuqing [2799 5346 3237]
XING Guoguang [6717 0948 0342]

ORG: Both of the Department of Computer Science and Technology

TITLE: "Kernel of a Modular Operating System"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 47-57

TEXT OF ENGLISH ABSTRACT: In this paper, a kernel of the modularized operating system which is designed with the modular design method PCM is presented. Its function and structures are described. Some procedures which are written in the system programming language XCY are given.

This kernel consists of some monitor malules which have improved the clarity, simplicity and reliability.

AUTHOR: JIN Dexin [6855 1795 9515]
YANG Fuqing [2799 5346 3237]
ZOU Yue [6760 1878]

ORG: JIN of the Shanghai Computer Factory; YANG and ZOU both of the Department of Computer Science and Technology, Beijing University

TITLE: "Concurrent Processes of a Modular Operating System"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 58-67

TEXT OF ENGLISH ABSTRACT: In this paper, the multiprogramming management technique, the concurrent processes among devices and the concurrent processes modules are discussed from the view of the structural design method PCM. The implementation of the procedures concerned which are written in the system programming language XCY are reported.

AUTHOR: ZOU Yue [6760 1878]
YANG Fuqing [2799 5346 3237]

ORG: Both of the Department of Computer Science and Technology

TITLE: "The Device and File Management of a Modular Operating System"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 68-77

TEXT OF ENGLISH ABSTRACT: A file system of the modularized operating system DJS 200/XT2, which is designed with the modular design method PCM is presented. The method and implementation of device resources classification and hierarchical management also are discussed.

AUTHOR: WANG Gongben [3769 2396 2609]

ORG: Department of Computer Science and Technology

TITLE: "Cyclic Hamming Error-correcting Codes and Their Applications in Computer Systems"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 78-87

TEXT OF ENGLISH ABSTRACT: In this paper a class of error-correcting codes called "cyclic hamming error-correcting" codes (CHEC) is developed. Such codes can be widely used for error correction and detection for computer systems, especially for high-density magnetic tape. CHEC can be used to correct all single-error bursts and to detect 98.64 percent of all possible double bursts, which is much better than CRC, for example, which detects only 89.96 percent of all possible double bursts. The accuracy of CHEC has been confirmed in a magnetic tape.

AUTHOR: ZHANG Haifan [1728 3189 5672]

ORG: Department of Computer Science and Technology

TITLE: "An Efficient Approach to Optimal Automatic Routing of Printed Circuit Boards"

SOURCE: Beijing BEIJINGDAXUE XUEBAO ZIRAN KEXUEBAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS PEKINENSIS] in Chinese No 3, 1981 pp 88-96, 77

TEXT OF ENGLISH ABSTRACT: In this paper the optimal ordering algorighm and the theorems determining the minimal track number used in the routing of one class of specific net sets are first given. Then the necessary and sufficient conditions using minimal track number To for the routing of general net sets is given. The corresponding ordering algorithm is also given: the general net set is first decomposed into some "macro subsets," then according to the above necessary and sufficient conditions the nets of macro subsets are ordered. Thus the routing is optimal, that is the track number used in the routing is minimal. Finally an interpretation of the obtained result from the viewpoint of graph theory is given.

9717
CSO: 4009/79

AUTHOR: ZHANG Kaiming [1728 7030 2494]
YE Ling [5509 0109]

ORG: Both of the Institute of Modern Physics, Fudan University

TITLE: "Electronic States of Li-GIC"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 249-262

TEXT OF ENGLISH ABSTRACT: A cluster model is proposed. The most stable geometry of LiC_6 is determined by minimizing the total energy of the cluster calculated by the charge self-consistent EHT method. The charge transfer between Li and C and the density of states are calculated. It is found that LiC_6 is a donor compound with metallic properties. According to the SCF charge transfer, the modified ionization energy of different atoms in the cluster can also be worked out and can be used as parameters for the tight-binding band-structure calculation. In parallel with the TB method, Green's function method is also used for qualitatively analyzing the electronic states contributed from Li and C.

AUTHOR: YANG Xirong [2799 0823 2837]
LIAO Xianbo [1675 7359 0130]
KONG Guanglin [1313 0342 5259]
LIU Changling [0491 2490 7227]

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "Investigation of the Localized States in Amorphous Silicon Films Using the Field Effect"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 263-266

TEXT OF ENGLISH ABSTRACT: The energy distribution of the gap state density $N(E)$ in undoped GD a-Si films has been measured by the field effect technique. The effects of different deposition conditions and annealing temperatures on $N(E)$ are compared.

AUTHOR: GAO Weibin [7559 4850 3453]
SHI Zhiwen [4258 1807 2429]
REN Qingyu [0117 1987 0151]
JU Jingli [7263 7234 7787]

ORG: All of the Institute of Semiconductors, Chinese Academy of Sciences

TITLE: "A Study of Defects in GaAs Substrates and GaAs-$Al_xGa_{1-x}As$ DH Epitaxial Wafers by X-ray Topography"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 267-272

TEXT OF ENGLISH ABSTRACT: Defects in GaAs substrates and GaAs-$Al_x Ga_{1-x}As$ DH (double heterostructure) epitaxial wafers have been observed by means of transmission X-ray topography. High resolution X-ray topography and metallographic techniques prove that the contrast in X-ray topographic photos is produced by crystal defects. An evaluation for the density of the defects in GaAs substrates and GaAs-$Al_x Ga_{1-x}As$ DH wafers is given according to the X-ray topographic photos.

The stripe lasers have been made by conventional LPE (liquid phase epitaxy) and proton bombardment. Measurement of the characteristics of the lasers shows that the device yield and quality correspond to our evaluation from X-ray topography for the density of the defects in the substrates and epitaxial wafers.

AUTHOR: LIANG Jingguo [2733 7234 0948]
FENG Sunqi [7458 1327 7871]
PAN Guiming [3382 2710 2494]
CHEN Weixi [7115 1232 0363]

ORG: All of the Department of Physics, Beijing University

TITLE: "TEM Study of the Configurations of Dislocations in LPE $Ga_{1-x}Al_xAs$ Layers"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 273-276

TEXT OF ENGLISH ABSTRACT: The configurations of dislocations in LPE $Ga_{1-x}Al_xAs$ layers have been observed by HVEM. TEM observations show that in the LPE layer there are some dislocation nets which are distributed inhomogeneously, many dislocation loops which are scattered in the dislocation nets and have different sizes, and dislocation clusters which are generated by inclusions. Models for the generation of the configurations of dislocations are discussed. Isolated stacking faults have also been observed.

AUTHOR: WANG Yongchen [3769 3057 2525]

ORG: Tianjin Electronic Materials Research Institute

TITLE: "Study of the Width of the Transition Region between GaAs Active and Buffer Layers Grown by VPE"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 277-287

TEXT OF ENGLISH ABSTRACT: A mathematical drift-diffusion model is used for the graded doping of double-layered VPE GaAs, from which the initial and final profiles of the impurities in active layers have been calculated, and an analytical solution for the width of the transition region is obtained. The theoretical results are in good agreement with experimental results.

The distribution coefficient of Sn in the gas-solid phase of the VPE GaAs has been experimentally measured. The formula for the theoretical calculation of the concentration is finally given.

AUTHOR: MA Xinrong [7456 9515 2837]
TIAN Lilin [3944 4539 2651]
LI Zhijian [2621 1807 1017]

ORG: All of the Institute of Microelectronics, Qinghua University

TITLE: "A Study on the Instability of the $C(t)$ Characteristics of P-Si MOS Structure"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 288-297

TEXT OF ENGLISH ABSTRACT: The instabilities of $C(t)$ and $C(V)$ characteristics of P-Si MOS structures have been experimentally studied in detail. A physical model, which explains the observed phenomena satisfactorily, is proposed. The method of boron implantation into Si in the region around the polysilicon gate proved useful in avoiding these instabilities. The experiment also revealed that, in this case, a suitable treatment of the samples is required in order to determine the minority carrier lifetime accurately by use of the $C(t)$ method.

AUTHOR: MA Xinrong [7456 9515 2837]
TIAN Lilin [3944 4539 2651]
LI Zhijian [2621 1807 1017]

ORG: All of the Institute for Microelectronics, Qinghua University

TITLE: "Simultaneous Determination of the Bulk and Surface Layer Lifetimes of Minority Carriers in a Semiconductor Using the $C(t)$ Characteristics of MIS Structures"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 298-306

TEXT OF ENGLISH ABSTRACT: When traps of high recombination ability exist in the surface layer of a semiconductor, the Zerbst formula needs some modifications. The modified formula reveals that the Zerbst plot is no longer a straight line. Using the $C(t)$ characteristic and the modified formula one can simultaneously determine both the surface and the bulk minority carrier lifetimes, as well as the approximate depth of the high recombination surface of the semiconductor. The good agreement between experiment and theory proves that our modification is successful.

AUTHOR: YU Guangao [0205 0385 7559]
JIN Lirong [6855 4539 2837]
ZHANG Chongren [1728 1504 0088]

ORG: All of Nanjing Solid State Device Institute

TITLE: "Doping Profile and I-V Characteristic Analysis for Hi-Lo GaAs IMPATT"

SOURCE: Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTOR] in Chinese No 4, Nov 81 pp 307-316

TEXT OF ENGLISH ABSTRACT: The breakdown voltage V_B of experimental diodes varies appreciably due to the nonuniformity of concentration and thickness of multilayer epitaxial materials. For this reason an analysis and calculation of V_B, the width of the depleted region and the electrical field profile for a given impurity profile are presented here. The experimental I-V characteristics relative to the impurity profile at room temperature were found. Thus, in practice, chips may be selected according to the breakdown voltage value and the shape of the I-V characteristic curve at high current density. This method of selecting chips has been applied to batch production.

9717
CSO: 4009/129

AUTHOR: LU Dexin [4151 1795 7451]
CAI Jianhua [5591 1696 5478]
WANG Jieying [3076 3381 5391]

ORG: LU and CAI both of the Department of Physics and the Institute of Solid State Physics, Nanjing University; WANG of the Department of Physics, Beijing Normal University

TITLE: "Different Phases and Resonance Line Shifts in Magnetic Superconductors"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 173-182

TEXT OF ENGLISH ABSTRACT: In this article we discuss the various phases of magnetic superconductors. Coupled equations for the magnetic and superconducting order parameters are derived and are used to investigate the conditions under which different phases appear. The frequency shifts of magnetic resonance lines brought about by phase changes are also studied.

AUTHOR: XING Dingyu [6717 1353 6877]
GONG Changde [7895 2490 1795]

ORG: Both of the Department of Physics, Nanjing University

TITLE: "Proximity Effects of Superconducting-Normal Interface"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 183-193

TEXT OF ENGLISH ABSTRACT: Proximity effects of superconducting-normal interface have been studied by using the *S-N* interface Green's function obtained in our previous work. The superconductive order parameters on both sides of the interface exhibit a spatial variation. Its extended distances from the interface are of the order of coherence length. Furthermore, two points are worth mentioning: 1) the order parameters are frequency dependent complex quantities and present an oscillatory behavior; 2) gapless regions may appear in the immediate neighborhood of the interface.

AUTHOR: ZHANG Xudong [1728 2485 2639]
PENG Wenan [1756 2429 1344]
XIONG Shougao [3574 1108 7559]

ORG: All of Baoji Nonferrous Metals Institute

TITLE: "The Explosive Bonding of NbTi-Cu Multifilament Superconductors"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 194-201

TEXT OF ENGLISH ABSTRACT: The technology of explosive bonding and properties of sample joints of NbTi-Cu multifilament superconductors are reported in this paper. The explosive bonding device and experiments carried out for determining the making-up prescription and bonding parameters are described. A number of explosive bonding experiments were carried out with superconductors of two kinds of cross sections (7 x 3.6 mm, Cu:NbTi = 10,204 filaments and 3.6 x 1.8 mm, Cu:NbTi = 5,174 filaments). The bonded superconductive joints are satisfactory. Excellent metallurgical bonding is found in all units including the NbTi filaments. After some easy repairs, the size and shape at the position of the joint are the same as that of the superconductor body itself. The joints have excellent bending properties and high tensile strength (33.1 kg/mm^2 at room temperature and 43.6 kg/mm^2 liquid nitrogen, corresponding to 97.3 and 100 percent of the tensile strength of the superconductor at the same conditions respectively). The superconductive

[Continuation of DIWEN WULI No 3, 1981 pp 194-201]

joints with the cross section of 3.6 x 1.8 mm (at 4.2 K, 5T) have the critical current of 1801 A, corresponding to 90 percent of that of the superconductor at the same conditions. The research results can be applied to the field of bonding the superconductors of the similar cross sections.

AUTHOR: None

ORG: Low Temperature Specialty Superconduction Group, University of Science and Technology of China; Group No 307, Institute of Plasma Physics; Shanghai Institute of Nonferrous Metals, Chinese Academy of Sciences

TITLE: "The Dynamic Stability in CVD Nb_3Sn Superconducting Tapes"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 202-211

TEXT OF ENGLISH ABSTRACT: The dynamic stability in CVD Nb_3Sn superconducting tapes has been studied both theoretically and experimentally. In consideration of a two-dimensional model, the stability criterion has been found to be

$$J_c^2 \leqslant \frac{hT_0}{b\rho_{Cu}} \cdot \frac{(1-\eta)(1+\omega\eta)}{\eta^2},$$

where η is the volume fraction of the superconductor, ω is a parameter characterizing the superconducting tape geometry and the cooling condition. Using the above criterion, we show that there exists an optimum copper-clad thickness which has maximum overall critical current density. This thickness is determined by the expression

$$\eta_{op} = \frac{\omega - 2\xi - 1}{(\xi + 2)\omega - \xi},$$

[Continuation of DIWEN WULI No 3, 1981 pp 202-211]

where ξ is the ratio of the thickness of the matrix to that of the superconductor. We have discussed the effects of the conductor geometry, thickness of copper clothing d_{Cu}, condition of cooling, applied magnetic field and transport current on the stability. With d_{Cu} reaching a certain value, a transition is made from dynamic stability to cryostatic stability. The theory is in good agreement with the results of the experiments by using simulation coils.

AUTHOR: None

ORG: Nb_3Ge Research Group, Changsha Research Institute of Mining and Metallurgy, Ministry of Metallurgical Industry

TITLE: "Preparation of Nb_3Ge by a Continuous CVD Process"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 212-218

TEXT OF ENGLISH ABSTRACT: This paper describes some preliminary studies of the preparation of the superconducting Nb_3Ge tape by using a high-speed and multilayer continuous CVD process. The Nb_3-Ge films were deposited on the Hastelloy B substrate at the tape speed of 15-23 m/hr by simultaneous hydrogen reduction of $NbCl_4$ and $GeCl_2$ vapor. Sample Nb_3Ge tapes of 2.5 mm in width and with the films on each side 5 μm thick has been prepared with A 15 Nb_3Ge as the major phase in the deposit. The sample as a T_c onset of 21.0 k and a T_c midpoint of 19.0 k, and its values of I_c and J_c (Nb_3Ge) have reached 115 A and 4.6×10^5 A/cm^2 at 4.2 K and 4 T, respectively. Some technological problems of improving the continuous CVD process for preparing practical Nb_3Ge tapes are discussed.

AUTHOR: Hu Suhui [5170 4790 6540]
YANG Tingping [2799 1694 5493]
TONG Husong [4547 4375 1529]
et al.

ORG: All of Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "A Study of Manufacturing Superconducting Wire from $Nb_3(Al_{0.75}Ge_{0.25})$ Powder"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 219-225

TEXT OF ENGLISH ABSTRACT: A process for manufacturing superconducting wires by drawing A-15 compound powder in copper tubing was proposed and tried out. Such ϕ0.3 mm wires containing Nb_3 ($Al_{0.75}$ $Ge_{0.25}$) powder were made with a resulting overall conductor current density $J_c = 6.7 \times 10^4$ A/cm^2 (4.2k, 7T) and a superconducting transition temperature T_c = 18.3 K, and with a good flexibility. Such a process could be applied to those A-15 superconducting compounds which have the stoichiometric composition A_3B and, at the same time, are stable in phase diagram and/or metastable after fairly rapid cooling.

AUTHOR: ZHANG Xuehua [1728 1331 5478]
ZHANG Liyun [1728 7787 0061]
XIN Wenfang [6580 2429 5364]
ZHU Dongsheng [2612 2639 3932]

ORG: All of the General Research Institute for Nonferrous Metals, Ministry of Metallurgical Industry, Beijing

TITLE: "Preparation and Analysis of Superconducting Nb-Ge Films by EBCE Technique"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 226-234

TEXT OF ENGLISH ABSTRACT: Experiments on electron beam co-evaporation were made on Nb-Ge in the substrate temperature range of 750-1050°C. The Nb-Ge films with higher critical temperature of 20-21.9 K can be deposited on the substrate by evaporation at 800-950°C under pressures of 10^{-5}-10^{-6} Torr with the deposition rate of a few A/s. The X-ray diffraction patterns indicate that there predominantly exists an A 15 structure phase and some other phases in the films. The dependence of T_c on the chemical composition, resistance ratio and lattice parameter has been studied. It is also revealed that the rich Ge films which deposit under higher temperatures exhibit T_2 phase with tetragonal structure, while those which deposit

[Continuation of DIWEN WULI No 3, 1981 pp 226-234]

under lower temperatures exhibit T phase with hexagonal structure. It is suggested that the surface states of the substrate may have some effects on the formation of the metastable A15-Nb_3Ge films.

AUTHOR: LIU Zhiyi [0491 1807 3015]
WANG Shouzheng [3769 1343 6214]

ORG: LIU of the Institute of Physics, Chinese Academy of Sciences; WANG of the Department of Physics, Beijing University

TITLE: "The Preliminary Study on the Superconductivity of the Rare Earth La and Its Compound La_3In"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 235-239

TEXT OF ENGLISH ABSTRACT: The rare earth element La with purity of 98.0 percent is used to prepare its alloy La_3In by using the livatation melting method, with T_c being 8.9 K. The effects of the high-speed liquid-phased cooling and the existing oxidation on La and La_3In T_c have been observed.

AUTHOR: ZHANG Chuntang [1728 2504 1016]
LI Zhiguang [2621 3112 1639]
SONG Shuguan [1345 2885 1351]
ZHAN Sheng [2069 0524]

ORG: All of Guangming Chemical Engineering Research Institute, Ministry of Chemical Industry

TITLE: "The Effects of Sample Dimension in the Impact Test at Low Temperatures"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 240-247

TEXT OF ENGLISH ABSTRACT: The present paper deals with the rules of variation in impact work with temperature and the width of samples, from room temperature to -196°C. The samples tested were either U-notched or V-notched 1Cr18Ni9Ti Osmondite stainless steel, pure Al, 20 and 45 fine carbon steel, with four sample widths of 10. 7.5, 5 and 2.5 mm. A formula is presented for conversion of the impact work between the standard samples and the nonstandard ones. A curve of the change in impact work with temperatures and a table of conversion coefficients of equivalent impact work between the standard and nonstandard samples are given in the paper.

AUTHOR: WANG Lan [3769 1526]
ZHU Xiuzhen [2612 4836 6966]
REN Keyuan [0117 0344 6678]
MA Wenfeng [7456 2429 7685]
FENG Yurun [7458 3768 3387]
KAN Jiaju [7074 1367 6880]
et al.

ORG: WANG, ZHU, REN, et al., all of the Southwest Institute of Physics; MA and FENG both of the Chungqing Instrument and Meter Material Institute; KAN of the Shanghai Automatic Instrument and Meter Factory No 3

TITLE: "The Development of a Rhodium-Iron Resistant Thermometer"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 248-257

TEXT OF ENGLISH ABSTRACT: Our paper presents the development of a standard rhodium-iron resistant thermometer for laboratory use and a general one for industrial use, gives the measurement principles and the results of the characteristic measurements, and includes the materials used for the thermometers, their structure, stability, resistance-temperature characteristics, sensitivity, magneto-resistance effects, self-heating effects and an analysis of errors, etc. The calibrated data are

[Continuation of DIWEN WULI No 3, 1981 pp 248-257]

treated by computers. A simple method of interpolation of a referential function table within the range of 2-273 K is recommended. A comparison of this thermometer with the British one is made.

AUTHOR: YANG Chunjiang [2799 2504 3068]

ORG: Shanghai Institute of Technical Physics, Chinese Academy of Sciences

TITLE: "A Practical Method of Calculating Shuttle Heat Transfer in a Refrigerator"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 258-262

TEXT OF ENGLISH ABSTRACT: In making designs of reciprocating refrigerators, a simplified equation has been used for calculating shuttle heat transfer. However, neglect has been shown of the effects on a few important parameters, such as physical properties of the walls and motion cycle of the displacer. An improved equation is derived.

AUTHOR: SHEN Zhigong [3088 1807 1562]
LIN Shuyuan [2651 3219 1254]
ZHANG Dianlin [1728 3013 3829]
DU Zhonglian [2629 0112 1670]

ORG: SHEN, LIN and ZHANG all of the Institute of Physics, Chinese Academy of Sciences; DU of Zhongshan University

TITLE: "Superconducting Chopper"

SOURCE: Beijing DIWEN WULI [ACTA PHYSICA TEMPERATURAE HUMILIS SINICA] in Chinese No 3, 1981 pp 263-266

TEXT OF ENGLISH ABSTRACT: This paper introduces the manufacturing technology and the main characteristics of a superconducting chopper. The optimum frequency of it is 100-300 Hz, and its sensitivity is less than 9×10^{-9}V.

9717
CSO: 4009/77

END

JPRS 79713

23 December 1981

China Report

SCIENCE AND TECHNOLOGY

No. 141

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79713

23 December 1981

CHINA REPORT

SCIENCE AND TECHNOLOGY

No. 141

CONTENTS

PEOPLE'S REPUBLIC OF CHINA

APPLIED SCIENCES

Briefs

Synchrotron Radiological Unit 1
Availability of Patent Documents 1

LIFE SCIENCES

Briefs

Shanghai Synthetic Insulin Research 2
Meeting on Schizophrenia 2

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

Physicist Informs NPC Panel of Scientific Gains
(XINHUA, 4 Dec 81) 3

PUBLICATIONS

Table of Contents of 'WUHAN SHUILI DIANLI LIXUE XUEBAO' No 3, 1981 5

Table of Contents of 'LIXUE YU SHIJIAN' No 4, 1981 7

ABSTRACTS

ARMAMENTS

BINGGONG XUEBAO [ACTA ARMAMENTARII] No 4, Nov 81 9

AUTOMOBILE TECHNOLOGY

QICHE JISHU [AUTOMOBILE TECHNOLOGY] No 10, 25 Oct 81............ 11

CHEMISTRY

HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] No 3, 1981 12

COMPUTERS

JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] No 6, Jun 81 21

ENGINEERING

WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] No 3, 1981 27

GEOLOGY

DIZHI XUEBAO [ACTA GEOLOGICA SINICA] Vol 55, No 4, 1981 33

METALLURGY

JINSHU XUEBAO [ACTA METALLURGICA SINICA] No 5, 1981 34

NONFERROUS METALS

YOUSE JINSHU [NONFERROUS METALS] No 4, 1981 42

OPTICS

GUANGXUE XUEBAO [ACTA OPTICA SINICA] No 4, 1981 50

PETROLEUM

SHIYOU XUEBAO [ACTA PETROLEI SINICA] Vol 2, No 4, 1981 66

SEISMOLOGY

DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] Vol 3, No 4, 1981 69

TEXTILE RESEARCH

FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] No 5, 1981 72

TOTAL QUALITY CONTROL

ZHILIANG GUANLI [QUALITY CONTROL] No 5, 29 Oct 81 73

VACUUM TECHNOLOGY

ZHENKONG [VACUUM] No 5, 25 Oct 81 74

BRIEFS

SYNCHROTRON RADIOLOGICAL UNIT--Hefei, 5 Nov (XINHUA)--The design and trial-production of China's first synchrotron radiological unit for accelerating electron and obtaining luminous emission have been successfully completed after 3 years of hard work. The project was done at the China University of Science and Technology with assistance from the plasma physics department of the Chinese Academy of Sciences, Zhejiang University and the Solid State Physics Research Institute of the Chinese Academy of Sciences. An evaluation meeting was recently held in Hefei by representatives from 30 units with satisfactory results. [Beijing XINHUA Domestic Service in Chinese 0742 GMT 5 Nov 81 OW]

AVAILABILITY OF PATENT DOCUMENTS--Beijing, 3 Nov (XINHUA)--Nearly 8 million patent documents imported from 15 countries and two international organizations are now open to Chinese readers, according to the documents library of the patent bureau of China. The documents are from Australia, Austria, Britain, Canada, Czechoslovakia, Democratic Republic of Germany, Federal Republic of Germany, France, Japan, Poland, Romania, Sweden, Switzerland, the U.S.A. and the U.S.S.R. as well as from the European patent office and patent cooperation treaty. China began to import them in 1965. In recent years, China has purchased a yearly average of more than 600,000 patent documents. According to the patent bureau, the opening of these documents will help more people learn current trends of the world's technology in order to promote China's science and technology. [Text] [Beijing XINHUA in English 1229 GMT 3 Nov 81 OW]

CSO: 4020/49

BRIEFS

SHANGHAI SYNTHETIC INSULIN RESEARCH--Beijing, 10 Nov (XINHUA)--Scientists have synthesized for the first time in China peptide C of human pro-insulin, an inorganic active material that exists in human blood serum, according to the Shanghai Institute of Biological Chemistry under the Chinese Academy of Sciences. The institute and the general hospital of the Chinese navy in Beijing have, since 1979, also developed a radioactive immunological technique for assaying the activity of peptide C in the body. According to a spokesman for the Shanghai Institute, these achievements are important to research of carbohydrate metabolism and the function of insulin, which is a biologically active protein that exists in the pancreas of the mammal. Since last year, 7 hospitals and medical research institutes in Shanghai and Beijing have used the method on 1,000 persons. The results are accurate, according to the general hospital of the navy. [OW111454 Beijing XINHUA in English 0810 GMT 10 Nov 81]

MEETING ON SCHIZOPHRENIA--Nanjing, 26 Nov (XINHUA)--China's first academic conference on schizophrenia, held by the Chinese Medical Association, recently met in the city of Suzhou, Jiangsu Province. Participating in the seven-day conference were delegates from across the nation except Taiwan and Tibet. Three hundreds papers presented at the conference indicated that advances have been made in recent years in pathogeny, incidence mechanism, psychology of schizophrenia and its treatment. A U.S. psychiatry delegation also attended. The U.S. delegates talked with their Chinese colleagues, and reported on young people's psychosis, children's psychosis and psychosis and the law. [Text] [OW261404 Beijing XINHUA in English 1238 GMT 26 Nov 81]

CSO: 4020/47

SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

PHYSICIST INFORMS NPC PANEL OF SCIENTIFIC GAINS

OW041903 Beijing XINHUA in English 1838 GMT 4 Dec 81

[Text] Beijing, December (XINHUA)--Noted Chinese physicist Qian Sanqiang said today that Chinese scientists are capable of solving difficult scientific problems once they are organized as proposed in Premier Zhao Ziyang's report to the National Pepple's Congress.

Speaking at a panel meeting held by the N.P.C. deputies from Tianjin, the vice-president of the Chinese Academy of Sciences said that Chinese scientists are intelligent. He chastised the idea that the Chinese are inferior in everything.

Even foreign scientists disagreed to that kind of thinking, he said.

"During my visits to the United States, France and other countries in recent years," he said, "whenever I said that I wanted to learn from foreign scientists, friends in these countries would reply: China might be comparatively backward in some branches of science, but it is fairly advanced or even well ahead in such branches as atomic science, guided missile and satellite sciences and in the synthesis of insulin.

"Of course," Qian Sanqiang said, "we must admit that our science and technology as a whole are relatively backward, but a fact is a fact, we are fairly advanced in the world in some branches of science and technology. There is no reason for us to belittle our capabilities."

Explaining how to develop science more quickly, Qian Sanqiang said that the most important thing was to organize the scientists to tackle scientific problems by giving full play to the superiority of the socialist system under the leadership of the communist party and government.

He cited the development of China's atomic science to illustrate his point. There were only a few nuclear scientists equipped with poor instruments when atomic research was first started in the early post-liberation years, he said.

"We had many difficulties owing to the blockade imposed by imperialism and social-imperialism. However, on the instruction of Chairman Mao Zedong, the Central Committee of the party and the State Council organized government departments and more than 20 institutes under the Chinese Academy of Sciences to coordinate in research work. It took us only a few years to solve the problems in experimental physics, detecting technology, theoretical physics, radioactive-chemistry, metallurgy and chemical engineering and we succeeded in exploding China's first atomic bomb on October 16, 1964. Two years and eight months later, we succeeded in exploding our first hydrogen bomb. But for these concerted efforts, such a big scientific and technological achievement in so short a time could not have been done."

These experiments were received with approbation by foreign scientists, he said. Some foreign scientists were sceptical about China's achievement in the synthesis of insulin. But when it was shown to them, they began to ask how China had managed to have it done. They were told that it was the result of the long term cooperation among 36 scientists from three scientific and educational institutions. They said that this could hardly be done in their countries.

"This once more demonstrates the superiority of our socialist system over the capitalist system," Qian Sanqiang said. "Once we get organized in the development of science and technology, our strength is tremendous."

He said that China now had many more scientists and technicians than in the fifties and their competence was much higher. "Premier Zhao Ziyang," he said, "has summed up the experience in scientific research and called upon us to get organized to tackle important scientific and technological problems. I am entirely for it," he said.

"Given the elimination of barriers among the departments and localities, the strengthening of leadership and the close cooperation among scientists, greater successes will surely be achieved in the tackling of key problems in science and technology, thus contributing to the modernization of our country," he said.

CSO: 4020/48

TABLE OF CONTENTS OF 'WUHAN SHUILI DIANLI LIXUE XUEBAO' NO 3, 1981

Wuhan WUHAN SHUILI DIANLI LIXUE XUEBAO [JOURNAL OF THE WUHAN INSTITUTE OF HYDRAULIC AND ELECTRIC ENGINEERING] in Chinese No 3, 1981 inside back cover

[Text] On the Suspension Indicator for the Vertical Distribution of Suspended Sediment Concentration Based on the Diffusion Theory......Xie Jianheng [6200 7003 5899] and Zou Lutai [6760 1462 3141], both of the Department of River Silt Engineering (1)

Vertical Distribution of Velocity and Turbulence Intensity in the Hyperconcentration Turbid Water......Wang Mingfu [3769 2494 3940], Wang Yunhui [3769 6663 6540] and Wang Mushan [3769 2606 1472], et al, all of the Department of River Silt Engineering (11)

Selection of Cross-sectional Areas for Steel Members under Axial Compression......Wang Xiangzhen [3769 6272 4631], Department of Water Conservancy, Tianjin University (29)

On River Bed Scour and Roughing......Qin Rongyu [4440 2837 2509], Water Conservancy and Hydropower Sciences Research Institute (42)

Problem of Calculation of the Earth Slope Stability...... Chen Zhen [7115 7201], Department of Soil Dynamics (55)

Automatic Tension-controlled Belt-drive Using Resistance Moment......Li Jiren [2621 4764 0088], Department of Machinery (69)

Homology Discrimination in Transient Stability Study...... Fu Xiafei (75)

Measurement of Temperature Time Constant of Calculation by Pseudo-thermal Resistance of Thermal Conduction Convection and Radiation......Chen Tianying [7115 1131 5391], Wuhan Institute of Hydraulic and Electric Engineering (81)

On the Reduction of NO_x Exhaust by Fractional Combustion......
Ni Shuhong [0242 2579 3163], Department of Thermodynamics (85)

The Principle and Installation of the Laser Velometer Model
JD-V-II......Laser Scientific Research Group (91)

The Analysis of Receiving Scattered Light Power in Mirror
Laser Velometer......Pan Shouqing [3382 1343 3237], Laser
Scientific Research Group (97)

9717
CSO: 4008/36

TABLE OF CONTENTS OF 'LIXUE YU SHIJIAN' NO 4, 1981

Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese No 4, 1981 p 1

[Text] Non-classical Flexural Theory of Structural Analysis and Its Use......Cao Zhiyuan [2580 1807 6678], Institute of Engineering Mechanics, Chinese Academy of Sciences (2)

The Formation and Some Properties of Ship Waves......Shen Guoguang [3088 0948 0342], Tianjin University (6)

Introduction to Thermo-physicochemical Properties of High-temperature Gases......Zhong Jiakang [6945 1367 1660], Zhejiang University (13)

Hydrodynamic Stability and Asymptotic Methods......Li Jiachun [2621 1367 2504], Institute of Mechanics, Chinese Academy of Sciences (21)

Several Optical Problems Related to Experimental Solid Mechanics......Wang Runwen [3769 3387 2429], Shanghai Institute of Optics and Fine Mechanics (27)

Applied Research

An Analysis of an Impact Damper Applied to the Self-excited Vibration in Machining Operation......Deng Weiwu [6772 0604 2745], Sichuan Chemical Engineering College (36)

An Experimental Method of Determining Static and Dynamic Shear Moduli G_s, G_d by Euler's and Timoshenko's Beams...... Wang Yunjian [3769 0061 0494], Institute of Engineering Mechanics, Chinese Academy of Sciences (39)

Finite Difference Solution of Laminar Boundary Layer...... Xu Weide [6079 4850 1795] and Kong Xiangqian [1313 4382 6197], both of the Harbin Marine Engineering College (43)

Numerical Analysis of Torsion with Restraint Twist for Strengthening Thin-wall Element......Cai Linsheng [5591 7792 4563], Taiyuan Heavy Machinery Design Institute (48)

A Simple and Convenient Method of Designing Compression Rods of Sections in Common Use......Wu Rongli [0702 2837 4409] (51)

Experiments and Measurements

Numerical Frequency-sweeping Vibration Synchronism Record Installation and Its Applications......Shang Jiuquan (53)

Experimental Studies on Damage to ThF$_4$ Protective Film by CO$_2$ Pulsed Laser......Fang Huiying [2455 1979 5391], Wang Chunkui [3769 2504 1145] and Fu Yushou [0265 5940 1108], all of the Institute of Mechanics, Chinese Academy of Sciences (57)

Camera with a Differential Interferometer and Its Evaluation......G. Smeets (60)

News and Trends

A Method of Computing the Distributions of Surface Pressures and Aerodynamic Properties for Complex Assemblies at Subsonic Speed (Wang Cancheng, Xu Deyou, Gu Longling); A Wind Tunnel Study of the Wind Loading on a Thin Hemispherical Shell (Ju Xinyan, Cheng Weiyan, Gu Zhifu, Sun Tianfeng); Plano-plate Interferometer with He-Ne Laser (Xia Shengjie); Hydraulic Gas Compressor (Wang Xianfu); Low-velocity Water Tunnel for Biological Research (Wang Xianfu); Thickness Measurements of Coal Bed by Using the High Pressure Water Jets (Jin Zhexue); HP5423A Structural Dynamics Analyzer (Huang Zhizhong); One Minute Equals 59 Seconds (Li Yuanheng) (65-68)

The Field of Mechanics

A Survey on the Research of Mechanics of Composite Materials of Britain and West Germany......Xian Xingjuan [3156 2622 1227], Institute of Mechanics, Chinese Academy of Sciences (69)

A Visit to Gottingen--An Ancient Place of Science......Liang Xizhi (73)

Bulletins...... (75, 64)

New Book...... (77)

Quizzes...... (79)

9717
CSO: 4008/35

AUTHOR: SUN Gengchen [1327 1649 6591]
et al.

ORG: None

TITLE: "A Simplified Model of the Penetration of the Long-rod Penetrator against the Plates with Semi-infinite Thickness at Normal Angle"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 4, Nov 81 pp 1-8

TEXT OF ENGLISH ABSTRACT: In this paper, an analysis is made of the main phenomena and the whole process of the normal impact by a long rod penetrator. A simplified calculating model of the penetration at a normal angle is established to illustrate the influence of the breakage of the rod as well as the material properties of the rod and plate on the penetration process and to quantitatively describe the regularity of variations in the velocity and length of the rod and depth of the penetration during the penetration against the plate with semi-infinite thickness. The velocity range is from 900 m/s to 1600 m/s. The calculations relatively conform to the testing results.

AUTHOR: SHI Jusheng [2457 5112 3932]

ORG: None

TITLE: "Engineering Calculation for the Sensitivity of the Autodyne"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 4, Nov 81 pp 23-31

TEXT OF ENGLISH ABSTRACT: Principles of the operation of the autodyne used in Doppler radio proximity fuses are analyzed in the autodyne as an *LC* oscillator. Based on the balance conditions of the *LC* oscillator, a formula for calculating the sensitivity of the autodyne is derived, applicable to electronic tubes as well as transistor autodyne devices. In this formula, not only the nonlinearity of transconductance of the devices, but also the nonlinearity of output and input characteristics are taken into account. In addition, the classification of operating state of the devices and their effect on the sensitivity of the autodyne are also studied.

AUTHOR: SUN Lizhi [1327 4539 1807]
QIAN Fuxing [6929 4395 2502]

ORG: None

TITLE: "Experimental Studies of Blunt Shells Equipped with Nose Spike in a Supersonic Wind Tunnel"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 4, Nov 81 pp 53-63

TEXT OF ENGLISH ABSTRACT: An investigation has been made of the flow over a series of blunt shell models equipped with nose spike and cylindrical afterbody at Mach numbers of 2.0 and 2.5, and experimental data and Shlieren photographs of typical flow behaviors are obtained. The processes of flow separation of spiked blunt bodies and the factors influencing spike tip separation or retarded separation are discussed, and steps to prevent retarded separation are proposed. The mechanism of flight stability of spiked blunt bodies and some design problems are discussed.

9717
CSO: 4009/145

AUTHOR: ZHOU Zhonglin [0719 0022 2651]

ORG: Automobile Engine Plant, Shijiazhuang City

TITLE: "Cause of Oil Leak in the Front Oil Seal of JiefangCA10B Engine"

SOURCE: Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 10, 25 Oct 81 pp 46-47

ABSTRACT: Oil leak in the front oil seal of JiefangCA-10B automobile engine is a common problem and one of the following is generally the cause of it: (1) The timing gear and the cylinder are not exactly aligned so that a space occurs during deceleration; (2) The axle hole on the crankshaft is not exactly positioned; (3) Poor quality oil seal; (4) The oil seal is bent or not properly installed; (5) The oil pass from the timing gear cover is either too small or obstructed to cause too much lubricant to be accumulated in the timing gear cover. When one or more of these problems exist, oil will be observed on the road especially there will be oil leaking out when the car is driven downhill. The process of analyzing the cause of the oil leak problem and measures taken to correct the condition are explained.

AUTHOR: None

ORG: None

TITLE: "Front and Inside Front Covers and Back and Inside Back Covers Explained"

SOURCE: Changchun QICHE JISHU [AUTOMOBILE TECHNOLOGY] in Chinese No 10, 25 Oct 81 p 58, front, inside front, back, inside back covers

ABSTRACT: Advertisements are used for covers in this issue of the journal: (1) The front cover, explained on p 58, introduces 4 products of the Fuzhou Municipal Automobile Repair and Assembly Plant including the Fuzhou-FZ-211 jeep, the Fuzhou-FZ-131 light diesel truck, the Fuzhou-FZ-130 light gasoline-powered truck, and the Fuzhou-FZ-621 tour bus (13-18 passenger size (2) The inside front cover introduces 10 tractor parts manufactured by Sheyang County Tractor Repair and Manufacture Plant of Jiangsu Province; (3) Several products, including oil seals, gaskets, etc. made by Changchun Municipal Automobile Parts Plant No 1 are introduced on the inside back cover. (4) The back cover is a full page advertisement introducing products of the Xiangyi Component and Instrument Plant of the State's Bureau of Instrument and Meter Industry. The plant is located in Hongjiang City of Hunan Province.

6168
CSO: 4009/137

AUTHOR: MA Peisheng [7456 3099 3932]
JIANG Biyun [3068 4310 0061]
ZHANG Jianhou [1728 1696 0186]

ORG: All of the Department of Chemical Engineering, Tianjin University

TITLE: "Critical Assessment of Viscosity and Its Correlation with Temperature for Gaseous Substances under Normal Pressure"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 193-205

TEXT OF ENGLISH ABSTRACT: The viscosity data of 61 gaseous substances under normal pressure are critically assessed. The data collected were published for 50 of the substances from 1967 to 1979, and for the others from 1960 to 1966. The mathematical expressions used in the literature for correlating viscosity data of gaseous substances with temperature are reviewed, systematized and selected to correlate the data assessed. The coefficients of the selected correlations are determined by the least squares method with a digital computer. The viscosity values calculated by these correlations are then compared with the experimental measurements. For the four-coefficient correlations, $\eta = A_0 + A_1T + A_2T^2 + A_3T^3$(I) and $\ln\eta = A_0 + B_0\ln T + B_1/T + B_2/T^2$(II), the overall percent deviations are 0.160 and 0.157 respectively. Equation (I) is recommended for simplicity of calculation.

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 193-205]

The two-coefficient correlations, $\eta = KT^{3/2}/(C+T)$(III), $\eta = A_0 + A_1T$(IV) and $\eta = aT^n$(V) have nearly the same accuracy of estimating viscosity values. Equation (IV) is simple for use and equation (III) can correlate data of a wider temperature range with an overall percent deviation of 0.460.

AUTHOR: SHEN Ziqiu [3088 5261 3061]
CHEN Yuchen [7115 3022 3819]
DING Jie [0002 3381]

ORG: All of Dalian Institute of Technology

TITLE: "Interphase Mass Transfer (II)--The Modified Surface Film Renewal Model for the Liquid Phase Mass Transfer Accompanied by a First-order Irreversible Reaction"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 206-216

TEXT OF ENGLISH ABSTRACT: Based on the modified surface film renewal model, a mathematical model for the liquid phase mass transfer accompanied by a first-order irreversible chemical reaction is derived, i.e.,

$$k_L\sqrt{\frac{\theta}{D}} = (1+S\theta)\left\{\sqrt{k_1\theta+S\theta}\ \mathrm{erf}\sqrt{k_1\theta+S\theta}+\frac{e^{-(k_1\theta+S\theta)}}{\sqrt{\pi}}\right\}$$

A discussion of the "Chemical Method" used for the determination of interfacial area is presented. In applying this model, $k_1\theta = 2$ is being taken as the condition for the absorption process approaching a steady state, and the concept for the time

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 206-216]

of reaction penetrating through θ_K is proposed. If the depth where the relative solute concentration being degraded to 0.01 is taken as the thickness of the reaction zone δ_K, an expression for calculating δ_K is derived. In addition, a process for calculating the interfacial area and the frequencies of surface renewal by this model is also suggested.

Based on the procedure proposed, some data taken from the literature are treated, and the results are compared with those from Danckwert's model.

AUTHOR: BAI Naibin [4101 0035 1755]

ORG: Shanghai Institute of Metallurgy, Chinese Academy of Sciences

TITLE: "Evaluation of the Energy of Activation of Chemisorption for H_2 and O_2 on Transition d-Metals"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 217-223

TEXT OF ENGLISH ABSTRACT: In this paper, an empirical method based on two atom-parameter equations is developed:

$$-\Delta H_0 = -31.11\frac{z}{r_{cov}} - 180\left(\frac{I - I_0}{I_0}\right) + 208.9$$

$$-\Delta H_{O_2} = -4.54\frac{z}{r_{cov}} - 180\left(\frac{I - I_0}{I_0}\right) + 212$$

The initial heats of chemisorption for H_2 and O_2 on transition d-metals are successfully evaluated. Furthermore, the energy of activation of surface chemisorption of oxygen with transition d-metal surfaces are empirically calculated using a

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 217-223]

bond energy bond order (BEBO) approach. The agreement of the calculated results with the experimental data is satisfactory. The metals are then classified approximately into three groups, A, B and C, in which the chemisorption properties are different from each other.

AUTHOR: HE Daxin [0149 6671 9515]
XIONG Cijin [3574 6337 6855]
YU Yi [0151 0001]

ORG: All of the Beijing Institute of Chemical Technology

TITLE: "A Study of the Characteristics of Cup-jet Absorber"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 224-240

TEXT OF ENGLISH ABSTRACT: A cup-jet absorber is one of the high velocity co-current equipments of mass transfer. Research on this equipment in related literature was only restricted to the operation conditions below the liquid-gas ratio $m = 8$ l/m^3, while works on the liquid-gas ratio $m = 10$ l/m^3 have not yet been found in the periodicals. The present paper deals with the study of the following two subjects: (1) Observation of the flow patterns in a cup-jet absorber; (2) Approach to the correlated method of the pressure drop and the mass transfer data of the cup-jet absorber under the high liquid-gas ratio.

The experiments were undertaken on air-ammonia-water system under the conditions of liquid-gas ratio $m = 4$ to 30 l/m^3 and gas velocity $w_G = 10$ to 50 m/s at the bottom of the cup. We arrived at the following conclusions:
(1) The operation regions of a cup-jet absorber were divided into three different

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 224-240]

flow patterns. The first state is known as a pulsation state, the second as a homogeneous and continuous state, and the third as an extreme turbulent state.
(2) We have presented the following empirical equations for a cup-jet absorber.

In a dry column, if $Re \leq 3.1 \times 10^4$, the pressure drop data for a cup-jet absorber are correlated

$$La = 8.95 \times 10^{-1} Re^{0.95}$$

and if $Re > 3.14 \times 10^4$,

$$La = 1.168 \times 10^{-1} Re$$

where La is the Lagrangian number and Re is the Reynolds number.

In a wetted-cup column with the dimensionless group $\frac{w_G \mu_G}{d_e^2 \gamma_G} > 0.06$ and

when $m \cdot \left(\frac{w_G \mu_G}{d_e^2 \gamma_G}\right) < 1$, the flow state is of the second pattern,

$$La = 4.83 \times 10^5 m^{0.605} \left(\frac{w_G \mu_G}{d_e^2 \gamma_G}\right)^{1.39}$$

when $m\left(\frac{w_G \mu_G}{d_e^2 \gamma_G}\right) \geq 1$, that is the third state,

$$La = 7.49 \times 10^5 m^{1.05} \left(\frac{w_G \mu_G}{d_e^2 \gamma_G}\right)^{1.96}$$

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 224-240]

where w_G--the gas velocity at the bottom of the cup, m/s;
γ_G--the gas density, kg/m^3;
μ_G--the gas viscosity, kg·s/m^2;
d_0--the diameter at the bottom of the cup, m.

In addition, we have also found that the mass transfer data can be correlated by the following empirical equation:

$$K_Y\sigma = 188 w_G{}^{1.04} m^{0.61}$$
$$N_{OG} = 1.03 w_G{}^{0.9} m^{0.6}$$

where, $K_Y\sigma$--the overall gas mass transfer coefficient for a cup-jet in kg-mols/h·m^3 (unit molar concentration difference);
N_{OG}--the number of overall gas transfer units for a cup-jet.

AUTHOR: WANG Zunxiao [3769 1415 1321]
LI Suzhen [2621 4790 3791].
ZHAO Guoqing [6392 0948 3237]
WANG Yuchen [3769 3768 3819]
SUN Jiakuan [1327 1367 1401]
JIANG Xianyi [5592 0341 0308]
ZHANG Zhiqin [1728 1807 0530]
CAI Baolin [5591 1405 2651]

ORG: WANG Zunxiao, LI, ZHAO and WANG Yuchen all of Shenyang Research Institute of Chemical Industry; SUN, JIANG, ZHANG and CAI all of Nanjing Organic Chemical Works

TITLE: "Selection of Internals for Fluidized Beds"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 241-245

TEXT OF ENGLISH ABSTRACT: Following the selection of internals for a 109 mm diameter fluidized bed, four kinds of internals were evaluated for a 360 mm diameter fluidized bed on the basis of the oxidation of o-xylene to phthalic anhydride. The yield of phthalic anhydride was chosen as the test index. The results obtained were essentially the same as those for the previous smaller bed, i.e., the lower baffles were the best, the perforated plate slightly inferior, and the vertical tubes the

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 241-245]

least ideal. But, when vertical tubes were used in combination with horizontal plates, equivalent effects were noted with plate-type baffles having smaller spacings. Regression equations showed that fluidized beds equipped with vertical tubes were less sensitive to temperature and gas velocity, implying that the flow patterns were not the same as those for horizontal internals.

AUTHOR: SHI Yanfu [4258 3508 4395]

ORG: Chemical Engineering Department, Chengdu University of Science and Technology

TITLE: "The Calculation of the Residence Time Distribution for Reactors with Circulating Systems"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 246-259

TEXT OF ENGLISH ABSTRACT: The residence time distribution for reactors with circulating systems is analyzed. Equations for calculation of this residence time distribution are derived. By means of the computer, the data of the residence time distribution at various cycle ratios have been obtained. Under some conditions the simplified methods for calculation of the residence time distribution for reactors with circulating systems are suggested.

AUTHOR: XU Zhong [1776 1813]

ORG: Department of Power Engineering, Xi'an Jiaotong University

TITLE: "Compressibility Factors of Gas Mixtures Containing Hydrogen"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 260-267

TEXT OF ENGLISH ABSTRACT: The Lee-Kesler equation has been extended to gas mixtures containing hydrogen when the modified Kay's rule proposed in this paper is used to determine pseudocritical constants of the mixtures. The modified Kay's rule is

$$P_{cm}=A\psi x_{H_2}P_{cH_2}+\sum_{i=1}^{n-1}x_iP_{ci}$$

$$T_{cm}=\theta x_{H_2}T_{cH_2}+\sum_{i=1}^{n-1}x_iT_{ci}$$

with $A = 1.15$, where ψ and θ are the shape factors.

By using the modified Kay's rule, the Lee-Kesler equation is applied to calculate the compressibility factors of three systems, which are nitrogen-hydrogen, hydrogen-methane-nitrogen, hydrogen-nitrogen-carbon dioxide-carbon monoxide-methane, all

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 260-267]

containing hydrogen, over a wide range of pressure and temperature. Computation of the compressibility factors is carried out in the following procedure:
1. for hydrogen, $\theta_Q = 1.45$, $\phi_Q = 0.633$,
2. calculation of $\frac{B}{\phi_Q V_c}$ and $(\frac{B}{V_c})_{re}$ from equations 6 and 7,
3. calculation of θ_T and ϕ_T from equations 4 and 5,
4. calculation of θ and ψ from equations 1 and 8,
5. calculation of P_{cm} and T_{cm} from equation 9,
6. calculation of the compressibility factors from equation 10.

The results are compared with experimental data presented in the literature. Agreement between calculated and experimental values is excellent for all three systems.

In the current work, the modified Kay's rule proposed here is further compared with the use of GCP's rule for finding pseudocritical constants. A comparison is made with the same systems. The results obviously indicate that the modified Kay's rule proposed here is more accurate than GCP's rule.

AUTHOR: LIU Guanghui [0491 0342 2585]
LUO Xianqi [5012 0341 7871]

ORG: Both of the Southwest Research Institute of Chemical Industry

TITLE: "Analysis of Organic Sulfur Compounds in Natural Gas"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 268-278

TEXT OF ENGLISH ABSTRACT: A procedure for qualitative and quantitative analysis of organic sulfur compounds in natural gas has been established. Chromatographic methods and selective chemical reactions have been used to determine the boiling points and structures of the sulfur compounds. Relative retentions of 12 S-compounds on 4 different liquid phases were given. Experiments on four compounds containing different S-groups indicate that within a certain concentration range, the responses of FPD as expressed by $h^{1/2}.w$ are independent of the nature of the S-group. Thus, a single calibration curve can be used to determine all S-compounds. Compared with other methods, satisfactory results of qualitative and quantitative analysis of three representative natural gases in Sichuan gas fields have been obtained.

AUTHOR: ZHUANG Zhenwan [5445 7201 8001]

ORG: Research Institute of Chemical Machinery, Ministry of Chemical Industry

TITLE: "Angle Factor for Radiation on a Bank of Oval Tubes in Staggered Arrangement"

SOURCE: Beijing HUAGONG XUEBAO [JOURNAL OF CHEMICAL INDUSTRY AND ENGINEERING] in Chinese No 3, 1981 pp 279-289

TEXT OF ENGLISH ABSTRACT: The angle factor for radiation on a tube bank is an important quantity in industrial furnace design. In the past years, the graphical representation was frequently used. In this paper, the formulas calculating the angle factors for radiation on a bank of oval tubes are derived. These formulas are usable for industrial furnace design. The primary results are as follows:

Single bank of oval tubes: The local angle factor at any given point A is:
Single-side radiation,

$$F_A=0, \quad \theta\leqslant-\theta_c$$

$$F_A=\frac{1}{2}\left[1+\sin\left(\angle PAE+\angle EAG-\frac{\pi}{2}\right)\right], \quad \theta\geqslant-\theta_c$$

Double-side radiation,

$$F_{A,D}(K_1,K_2,\theta)=F_A(K_1,K_2,\theta)+F_A(K_1,K_2,-\theta)$$

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 279-289]

where /_PAE and /_EAG can be calculated from the given equations.

Double bank of oval tubes: The local angle factor at any given point is:
Single-side radiation (the bank which is far away from the radiation side),

$$F'_A = \sum_N F_{NA} = \sum_{N=-3}^{3} F_{NA}$$

$$F_{NA} = 0, \qquad \theta < \theta_{N2}$$

$$F_{NA} = \frac{1}{2}\left[1 - \sin\left(\frac{\pi}{2} - \frac{N}{|N|}\angle P_{N2}AE + \frac{N}{|N|}\angle GAE\right)\right]$$

$$\theta_{N2} \leqslant \theta \leqslant \theta_{N1}$$

$$F_{NA} = \frac{1}{2}\left[\sin\left(\frac{\pi}{2} - \angle GAE - \frac{N}{|N|}\angle P_{N1}AE\right)\right.$$

$$\left.- \sin\left(\frac{\pi}{2} - \angle GAE - \frac{N}{|N|}\angle P_{N2}AE\right)\right]$$

$$\theta_{N1} \leqslant \theta \leqslant \frac{\pi}{2}$$

[Continuation of HUAGONG XUEBAO No 3, 1981 pp 279-289]

Double-side radiation,

$$F_{A,D}(K_1, K_2, K_3, \theta) = F_A(K_1, K_2, \theta) + F'_A(K_1, K_2, K_3, -\theta)$$

where /_GAE, /_P_{N1}AE and /_P_{N2}AE can be calculated from the given equations.

Some calculated results of the angle factor for radiation to a single bank of oval tubes are given in a table as an illustrative example.

9717
CSO: 4009/139

AUTHOR: GUAN Jiwen [4619 4764 2429]

ORG: Jilin University

TITLE: "On the Odd-Even Property of Linear Automata"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 401-408

TEXT OF ENGLISH ABSTRACT: According to the state diagrams of linear automata, one can easily see whether their state transformation is odd or even. In this paper some results are reported on the decision of the evenness by elementary divisors, in accordance with the state diagram theories of linear automata.

AUTHOR: CHEN Shihua [7115 0013 5478]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "On the Structure of Weak Inverses of a Weakly Invertible Linear Finite Automaton"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 409-419

TEXT OF ENGLISH ABSTRACT: This paper gives an account of a method by which one may find out all weak inverse linear finite automata with delay τ for a weakly invertible linear finite automaton with delay τ. This method consists of two steps. First, given a weakly invertible linear finite automaton M with delay τ, find out all transfer function matrices of weak inverse linear finite automata with delay τ of M. Then, for any such transfer function matrix $H^n(z)$, one may find out all weak inverse linear finite automata with delay τ of M, the transfer function matrices of which are the same $H^n(z)$.

AUTHOR: LU Ruqian [7120 3067 6870]
WEI Zichu [7279 2737 2806]

ORG: Both of the Institute of Mathematics, Chinese Academy of Sciences

TITLE: "The Self-compiler of the System Assembler Language XHY"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 420-430

TEXT OF ENGLISH ABSTRACT: XHY is one of the basic tools used to transport software in the XR project. This paper describes a self-compiler of XHY, including its basic ideas and techniques, concentrating mainly on two problems, i.e., the implementation of some peculiar language constructs in XHY and the design and implementation of self-compiling, multistage operation and transportation.

AUTHOR: GENG Lida [5105 4539 1129]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Fundamental Principles of JF-111, a Multilingual Machine Translation System"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 431-439

TEXT OF ENGLISH ABSTRACT: The JF-111 system is designed as a machine translation system for natural languages which is capable of multilingual translation when it is provided with linguistic data in a general and well-known form. Some tests have been carried out on the translations from English to Chinese, German to Chinese and French to Chinese.

The system exhibits a series of important characteristics in the strategy of designing software implementation and application:
1. The system has adopted some concepts and approaches from mathematical linguistics and compiler construction techniques.
2. The software system is applicable to many natural-language translations. Its program does not have to be revised with the change of the input languages.
3. Operation and quality improvements are highly automated so that manpower is saved and efficiency raised.

AUTHOR: HU Mou [5170 6180]
K.C. Smith

ORG: HU of Shanghai Institute of Railway Technology, China, visiting the University of Toronto; Smith of the Department of Electrical Engineering, University of Toronto, Canada

TITLE: "On the Use of CMOS Ternary Gates to Realize a Self-checking Binary Logic System"*

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 440-449

TEXT OF ENGLISH ABSTRACT: A scheme is proposed by which nernary gates realized with CMOS technology implement a self-checking binary system. All single faults in these gates can be divided into three types, called mid-seeking, mid-rejecting and masked. It is proven that the binary logic system realized with these gates is totally self-checking for mid-seeking faults. For mid-rejecting faults, the system is shown to be easily testable. A procedure for deriving test codes for mid-rejecting faults is presented. In addition, the effects of masked faults in the system are analyzed.

* This work was conducted at the Department of Electrical Engineering, University of Toronto.

AUTHOR: LIU Tinghua [0491 1656 5478]

ORG: Computing Technique Research Institute, China Aeronautical Establishment

TITLE: "On Efficiency Computation and Generation of Test Bit Patterns for Digital Magnetic Recording"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 450-458

TEXT OF ENGLISH ABSTRACT: In this paper, the worst bit patterns of NRZI and Run Length Limited Codes (RLLC) are briefly described. General modes of elementary worst patterns and worst pattern sequences are given. In particular, the model and algorithm of efficiency computation are presented. In addition, a general solution based on J.L. Massey's theory is worked out for the problem of synthesizing the shortest Linear Feedback Shift Register (LFSR) capable of generating a finite sequence of worst patterns. As an example, a 16-bit worst pattern of NRZI code and its generator are given.

AUTHOR: ZHANG Xiang [1728 4382]
GAO Qingshi [7559 1987 3740]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Principle of Automatic Vector-Displacement and Its Iteration"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 459-467

TEXT OF ENGLISH ABSTRACT: This paper introduces an interconnection network of cellular vector computer of vertical and horizontal processing with virtual common memory. In regard to this network a principle of automatic vector-displacement is presented, and a necessary and sufficient condition of conflict-free vector-displacement is given. To solve the problem of vector-displacement conflict caused by either memory bank conflict or transmission path conflict, an iterative method of automatic vector-placement is further proposed. Finally, some results of both probability estimation and digital simulation for the number of displacement iterations of an evenly distributed random address vector are given.

AUTHOR: QIAO Xiangzhen [0829 7449 3791]
ZHANG Xiang [1728 4382]
GAO Qingshi [7559 1987 3740]

ORG: All of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "An Efficient Parallel Algorithm for Solving a Linear System of Algebraic Equations"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 468-475

TEXT OF ENGLISH ABSTRACT: When the Gaussian elimination method is used for solving a linear system of algebraic equations on an array processor or a cellular vector computer, the main operation is to perform a great many row vector transformations. Assume that a computer consists of S parallel processors and is used to solve an N-order equation system. In the case of $S \gg N$, the system efficiency will be very low because of the fact that at least (S-N) processor are not at work in row vector transformations. This paper proposes a parallel algorithm which can be realized on a Cellular Vector Computer of Vertical-Horizontal Processing with Virtual Common Memory to enhance greatly the system efficiency.

AUTHOR: ZHANG Jinwen [1728 6930 2429]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Higher Order and Transfinite Incompleteness"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 476-478

TEXT OF ENGLISH ABSTRACT: *Definition 1.* Let K be the number-theoretic formal system. The formula $P(x)$ (where x is a variable, $P(x)$ contains x free, and $P(x)$ does not contain another variable free) in K is said to be the formalization of the provability, if for any statement A in K, we have

(1) If K is consistent, then: $\vdash A \Rightarrow \vdash P(\underline{A})$;

(2) If K is consistent, then: $\vdash \neg A \Rightarrow \vdash \neg P(\underline{A})$;

(3) If K is ω-consistent, then: $\vdash P(\underline{A}) \Rightarrow \vdash A$,

where $\underline{A}$ denotes the Godel number of the formula A. In the present paper we give the construction of the provability $P(x)$.

Definition 2. For any formalization of the provability $P(x)$, and any statement A, we put

$$A_0 =_{df} A,\quad A_{i+1} =_{df} \neg P(\underline{A_i}),$$
$$A^0 =_{df} \neg A,\quad A^{i+1} =_{df} \neg P(\underline{A^i}),$$

[Continuation of JISUANJI XUEBAO No 6, Jun 81 pp 476-478]

where $i = 0, 1, 2, \ldots$. It is clear that A_i, A^i are all uniquely determined by formulas A, $P(x)$ and natural number i.

Theorem 1. If K is consistent, for any formalization of the provability $P(x)$ and any natural number n, then there is a statement A, such that

$$\neg\mid\vdash A_i,\quad \neg\mid\vdash A^i,$$

where $i = 0, 1, 2, \ldots, n$, and "$\neg\mid\vdash B$" denotes "B is unprovable in K."

Theorem 2. If K is consistent, for any formalization of the provability $P(x)$, then there is a statement A, such that

$$\neg\mid\vdash A_i,\quad \neg\mid\vdash A^i,$$

where $i = 0, 1, 2, \ldots$.

AUTHOR: WANG Yuansong [3769 0337 2646]
HUA Younian [5478 2589 1628]
HUANG Liu [7806 7511]

ORG: All of Beijing Polytechnic University

TITLE: "Laser Chinese Character Printer"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese No 6, Jun 81 pp 479-480

TEXT OF ENGLISH ABSTRACT: This paper describes the main features and operating principle of the laser Chinese character printer and its connection situation with the electronic computer DJS-6, whose capabilities are also described. The printer weighs under 150 kg and prints 500-1000 characters per second.

9717
CSO: 4009/124

AUTHOR: WU Xuemou [0702 1331 6180]

ORG: Wuhan Digital Engineering Institute

TITLE: "Pansystem Methodology"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 1-8

TEXT OF ENGLISH ABSTRACT: Pansystem analysis is a new transfield interdisciplinary investigation and application of generalized system-transformation-symmetry in mechanisms. Pansystem methodology is an intersection of pansystems analysis and scientific methodology. It is also a pansystematization of concepts of methodology. Following the author's previous papers, this paper discusses the historical trend of the development of science and presents new panhomomorphism theorems, decomposition theorems, discoupling theorems, co-diagnosis theorems, operation projection theorems and theorems of series-parallel analysis of large-scale pansystems. These theorems are transfield and will be used in mathematics, methodology, graph theory, theory of fuzzy sets, cybernetics, large-scale system theory, system engineering, etc.

AUTHOR: ZHANG Nanlun [1728 0589 4858]

ORG: Wuhan Institute of Building Materials

TITLE: "The Membership and Probability Characteristics of Random Appearances (III)"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 9-24

TEXT OF ENGLISH ABSTRACT: The membership function of fuzzy subsets can actually be obtained with a sampling survey method. Practice proves there is some stability in the membership frequency derived from the method.

It is intended to show that the fuzzy appearances may fall into the category of random appearances. In this case, the concept of the probability space has to be extended.

AUTHOR: HUANG Shiyuan [7806 1102 0337]

ORG: Wuhan Institute of Building Materials

TITLE: "Hydration of Fly Ash Cement at Elevated Temperatures"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 25-32

TEXT OF ENGLISH ABSTRACT: The effect of the curing temperature on the strength, CH content and degree of C_3S hydration of fly ash cement and pure cement was studied. The microstructure of the fly ash cement paste was observed by scanning electron microscopy (SEM). It has been found that an addition of a proper amount of gypsum to fly ash cement accelerates the reaction between CH and fly ash and increases the degree of C_3S hydration during steam curing. The change in microstructure with the addition of gypsum was also observed.

AUTHOR: YUAN Runzhang [5913 3387 4545]
ZHU Xiean [2612 7327 1344]
OUYANG Shixi [2962 7122 0013 5047]
GAO Qiongying [7559 8825 5391]

ORG: All of Wuhan Institute of Building Materials

TITLE: "Study of the Structure of Slag Glass and Its Properties"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 33-43

TEXT OF ENGLISH ABSTRACT: A thorough study of the relationship between the hydraulic activity and the structure of granulated blast-furnace slags is of great importance in revealing the essence of the latent binding property possessed by slags. In the present paper the merits and demerits both of chemical analysis and of the strength test which are in common use and with which the hydraulic activity of slags is characterized have been reviewed; the influence of various cations in the quaternary system of $CaO-MgO-Al_2O_3-SiO_2$ on the structure of slag glass analyzed; and by applying the modern theory of glass structure, the criteria for measuring the hydraulic activity of vitreous Egt, Ent slag and their calculations are proposed. Experiments show that the calculated value of Egt and Ent is correlated under given conditions with the solubility of slags and the compressive strength of the slag cement.

AUTHOR: ZHANG Zhongyuan [1728 0022 0337]

ORG: Wuhan Institute of Building Materials

TITLE: "The Stability of the Spherically Structural Face on the Stope Roof"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 45-58

TEXT OF ENGLISH ABSTRACT: The problem of stability of the spherically structural face on the roof of the underground stope is investigated from the two respects of engineering geology and rock mechanics together with the xenolith in Kimberlite pipe. Through analyzing its failure mechanism, the strength condition is indicated, the mechanical model established and the formulas for the diameter of minimum critical safety are derived. Having studied the geological features of rock mass in which the spherical structure face lies, experimented with destructive tests of the combined faces between xenolith and ore, and observed in-situ the stability of xenolith, this paper discusses the relationship between the stability of the spherically structural face on the stope roof and the existence of other types of structural planes, the action of groundwater, the magnitude of corrosion and weathering, and the technological mining process. Finally, measures are proposed to deal with the stability of xenolith on the roof in productive practice.

AUTHOR: SU Fenwei [5685 1164 0251]

ORG: Wuhan Institute of Building Materials

TITLE: "A Study of the Concentrating Theory of Anti-flow Screening--Effects of Air Resistance on the Screening Process"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 59-76

TEXT OF ENGLISH ABSTRACT: Starting from research of individual granula, the law of movement of aggregate granules of different properties is analyzed when they are affected by air resistance over the screen plate. A new approach to the concentrating mechanism of anti-flow screening is presented, i.e., the concentrating process means the combination of friction concentration with gravity concentration. Two effective means of screening short fibers are also proposed: one is to increase the throwing strength K_V, and the other is to supply intake air on the screen plate or add upstream air under it.

AUTHOR: GONG Gaosun [7895 2640 5549]

ORG: Shanghai Building Materials Specialty School

TITLE: "Computing Cylindricity Error by Least Square Method"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 77-83

TEXT OF ENGLISH ABSTRACT: When a least square axis equation of an actual cylinder is established, not only the cylindricity error of this cylinder can be determined, but the positional error between the axis and other elements of this measured workpiece can also be determined. Based on the measured data for the actual cylinder, a least square axis equation is drawn in this paper.

AUTHOR: FAN Cunxu [5400 1317 2485]

ORG: Wuhan Institute of Building Materials

TITLE: "Analyzing Frame Systems by Energy Method"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 85-96

TEXT OF ENGLISH ABSTRACT: An energy method is used to analyze frame systems in this paper. The method is very effective for calculating continuous beams and any frame system. The effects of various support conditions, loads and different external factors (such as displacement of supports and temperature changes) on the structure are analyzed.

AUTHOR: LI Guiqing [2621 2710 7230]
QU Weilian [4234 0251 1670]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "The Influence of the 'P-Delta' Effect on Nonlinear Dynamic Earthquake Responses--An Analysis of Stiffness of Bar Members in Consideration of the Nonlinearity and Geometrical Nonlinearity of Materials under Conditions of a Large Deflection"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 97-109

TEXT OF ENGLISH ABSTRACT: Based on the principle of energy variation, a stiffness matrix of bar members is presented here, including the influence of shear deformation of the member itself, and taking the nonlinearity and geometrical nonlinearity of materials into consideration. Two kinds of implication of the "P-Delta" effect are analyzed. The working conditions of the bar member at the elasto-plastic stage are rather comprehensively represented.

AUTHOR: LI Guiqing [2621 2710 7230]
SHI Zhe [4258 2678]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "A Method for Estimating Free Flexural Vibrations of Cantilever Bar of Multi-step Varying Cross Sections with Lumped Mass"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 111-122

TEXT OF ENGLISH ABSTRACT: The free flexural vibration of cantilever bar of multi-step varying cross sections with lumped mass is studied in this paper. The mass and stiffness of the cantilever bar are shown respectively by

$$\overline{m_i}\,(x) = a_i(1 + \beta_i x)^r$$
$$\overline{K_i}\,(x) = \alpha_i(1 + \beta_i x)^{r+2}$$

The differential equation of the vibration mode is changed to Bessel's equation, and the relationship between the angle θ_i of rotation at the end of every step and its absolute displacement A_i is represented in terms of finite difference, i.e.,

$$\theta_i = \frac{A_{i+1} - A_{i-1}}{h_{i+1} - h_{i-1}} \qquad i = 1, 2, \ldots, n-1$$

[Continuation of WUHAN JIANCAI XUEYUAN XUEBAO No 3, 1981 pp 111-122]

$$\theta_n = \frac{A_n - A_{n-1}}{h_n - h_{n-1}}$$

In these formulas, h_i represents the height from the ground to the lumped mass. Then, the formula expressing the Bessel function can be derived.

AUTHOR: LI Guiqing [2621 2710 7230]
HUC Kaicheng [7202 0418 2052]

ORG: Both of Wuhan Institute of Building Materials

TITLE: "A Study of the Dynamic Property of Frame Structure Light Slab Buildings"

SOURCE: Wuhan WUHAN JIANCAI XUEYUAN XUEBAO [JOURNAL OF WUHAN INSTITUTE OF BUILDING MATERIALS] in Chinese No 3, 1981 pp 123-141

TEXT OF ENGLISH ABSTRACT: Several main forms of structure and characteristics of the system of frame structure light slab buildings are briefly commented on. Through the pulsation test of buildings which were experimentally constructed of frame structures and light slabs in eight large cities of China, and by testing and analysis of sudden unloading for two houses, the dynamic property of these new types of buildings has been investigated and a calculating method is advanced.

9717
CSO: 4009/144

AUTHOR: HUANG Shaoxian [7806 0508 7359]
JIN Fengcai [7246 7685 1752]
DI Junheng [6732 0689 1854]

ORG: All of Beijing Research Institute of Uranium Geology

TITLE: "On the Relationships between the Uranium Deposits and the Regional Geological Setting in the Meso-Cenozoic Continental Clastic Rocks of China"

SOURCE: Beijing DIZHI XUEBAO [ACTA GEOLOGICA SINICA] in Chinese Vol 55 No 4, 1981 pp 290-296

TEXT OF ENGLISH ABSTRACT: The uranium deposits of the continental clastic rock type of China may be classified into four types:
1. Uranium mineralization in the stable regions. Such regions are situated in platforms with early consolidated basements, and characterized by gently folded sedimentary strata, with minor disconformities and little magmatic activity. As there were no good source rocks for uranium, it is hardly possible to find large uranium deposits in the stable regions.
2. Uranium mineralization in the strongly active regions. Such regions are strongly folded and faulted, with intense magmatism, so that the depositional environment for the uranium mineralization to take place was very unstable. For this reason there was not sufficient time for the formation of large uranium deposits, either primary or secondary. But within such a region there might exist

[Continuation of DIZHI XUEBAO Vol 55 No 4, 1981 pp 290-296]

some less active areas where better deposits could be found.
3. The uranium in semi-stable regions. Such regions are situated in the transition zone between the stable region and strongly active region, or in the intermontane basin and the piedmont depression of a mountain belt. Due to the intermediate type of stability, both the paleogeography and the environment of sedimentation are more favorable for uranium mineralization to take place than the abovementioned two types. Moreover, magmatic activity usually occurs in such a region so that large uranium deposits might be formed.
4. Uranium mineralization of the superimposed type (the early-formed sedimentary mineralization enriched by later magmatic activities). Such a type of uranium mineralization may be found in the stable, semi-stable and even in the active regions. It is characterized by the fact that there existed a stable erosion period in which a weathering crust developed, leading to the formation of uraniferous beds. This might be followed by magmatic activities which helped to redistribute and enrich the uranium in the uraniferous beds. By the process of multiple redistribution and enrichment of uranium, large uranium deposits may be formed.

A comparison between the clastic uranium deposits of the United States and those of China is also made in the paper.

9717
CSO: 4009/150

AUTHOR: YAN Benda [7346 2609 6671]
WU Jiansheng [0702 1696 3932]
LIN Dongliang [2651 2767 2733]
Y.T. CHOU [0719 0110 5547]

ORG: YAN, WU and LIN all of Shanghai Jiaotong University; CHOU of the Department of Metallurgy and Materials Science, Lehigh University, U.S.A. (Adjunct Professor of Shanghai Jiaotong University)

TITLE: "Numerical Solution of Elastic Energy of Elliptic Inclusions Oriented in <100>, <110> and <111> Directions in Cubic Crystals"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 489-505

TEXT OF ENGLISH ABSTRACT: The elastic inclusion problem, that is, the calculation of the stress-strain field and the elastic energy of an anisotropic elastic medium with an elastic inclusion contained in it, is one of the important problems in materials science. In particular, the variation of the elastic energy of the system with the orientations of the inclusion in the medium (i.e., the orientational dependence of the elastic energy) and the orientation of the inclusion corresponding to the minimum of the elastic energy of the system are of great theoretical and practical significance in the investigations of the habit orientations of the phase transformations and precipitate particles, the prediction of the microcracking

[Continuation of JINSHU XUEBAO No 5, 1981 pp 489-505]

direction as well as the optimum distribution of the reinforcement fibers in the composites.

Based on the "Point Force-Line Force Method" given by H.Y. Yang and Y.T. Chou in 1976, a general computer program is compiled, which is applicable to the numerical calculation of the elastic energy of the elliptical inclusion oriented in any direction of the anisotropic medium for the generalized plane problem. The values of the elastic energy of the elliptic inclusions with their cylinder axes along the <100>, <110> and <111> directions in cubic metals Fe, Nb and Al were computed, and the dependence of elastic energies on the orientation of cross elliptic sections, rotating around their cylinder axes, has been illustrated explicitly in graphic charts.

The following conclusions are deduced from the calculation results:
1. The system has its elastic energy when the inclusion is lying on the crystal planes and oriented along the crystal directions of low indexes.
2. The elastic energy of the system with the inclusion subjected to pure shear strain in one-third to one-half of that with the inclusion subjected to principal strain.
3. The elastic energy of the anisotropic system with thin plate inclusions is very small. As the elliptic index $e = \frac{b}{a} \to 0$, the elastic energy of the system approaches nil.

[Continuation of JINSHU XUEBAO No 5, 1981 pp 489-505]

4. If the boundary energy could be neglected, the new phase and the precipitate with the lowest elastic energy would take the thin plate shape and shear mode in phase transformations and precipitation.

AUTHOR: ZHAO Liancheng [6392 6647 1004]
GUO Song [6753 2646]
LEI Tingquan [7191 1694 2938]

ORG: All of Harbin Institute of Technology

TITLE: "Martensitic Transformation and Shape Memory Effect of Cu-32.23 percent Zn-1.84 percent Al Alloy"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 506-512

TEXT OF ENGLISH ABSTRACT: The modifications of martensitic transformation and the shape memory effect of Cu-32.23 percent Zn-1.84 percent Al alloy have been studied. A thin plate-like elastic martensite is found after the alloy quenched into cooling medium of higher temperatures, namely, of smaller T_q-M_s. In addition, the butterfly-like bursting martensite may be partly formed after being quenched under lower temperatures of T_q-M_s. The transformation into bursting martensite increases in amount with the decrease of quenching temperature, and is completed at -70°C. Experimental results indicate that the shape memory effect of the alloy is only related to the transformation behavior. The martensite of the thin plate-like type, other than that of the butterfly-like bursting mode, has such an effect. The growth and disappearance of induced martensite plates under bending stress have also been directly observed by the optical microscope.

AUTHOR: LIU Wenxi [0491 2429 6007]
WANG Binghui [3769 0393 6540]
ZHONG Keduan [6945 0344 4551]
ZHANG Cunxin [1728 1317 0207]

ORG: All of the Nei Monggol Metal Materials Research Institute

TITLE: "Studies of Carbides in 6Cr4Mo3Ni2WV Steel"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 513-521

TEXT OF ENGLISH ABSTRACT: The carbides in 6Cr4Mo3Ni2WV steel have been studied by TEM, electrolytic extraction phase analysis, X-ray diffraction and EMPA. It was confirmed that the M_2C with long-range ordered carbon distribution and V_4C_3 with short-range ordered vacancy distribution are present in the residual carbides of the steel quenched from 1120°C. The nucleation of V_4C_3 with concomitant M_2C was observed during the tempering precipitation. The distribution of alloying elements partitioned between steel matrix and carbides is thus ascertained.

AUTHOR: MA Shuqin [7456 3219 3830]
ZHENG Yunrong [6774 6663 2837]
CAI Yulin [5591 3768 2651]

ORG: All of the Institute of Aeronautical Materials

TITLE: "Solution and Transformation of Ni_5Zr in Cast Nickel-base Superalloy"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 522-528

TEXT OF ENGLISH ABSTRACT: Studies were made of the solution and transformation of intermetallic compound Ni_5Zr in Zr-bearing cast Ni-base superalloy and of the effect of the Zr addition on the microstructure of DTA together with metallographic observation. The occurrence of Ni_5Zr in the superalloy may markedly decrease the incipient melting temperature and induce the solution of $\gamma+\gamma'$ eutectic. Under high temperature exposure above 850°C, Ni_5Zr with γ (C) is transformed into ZrC and γ, which is bound to be reflected in DTA.

AUTHOR: ZHANG Yongfu [1728 3057 4395]
BAO Weiguo [0545 0251 0943]
JIANG Shaoyou [3068 4801 3731]
LU Guoliang [1712 0948 2733]
LIN Rongfu [2651 2837 1381]
DAI Daoxuan [2071 6670 1357]
DONG Shuzhong [5516 2885 1013]
HUANG Guozhu [7806 0948 2691]
XU Kexun [1776 0344 5651]

ORG: ZHANG, BAO, JIANG and LU all of the Institute of Shanghai General Petrochemical Works; LIN, DAI and DONG all of the Physics Department, Fudan University; HUANG and XU both of Shanghai Institute of Material Research

TITLE: "An XPS Study of Anodic Oxide Film on 1Cr18Ni9 Stainless Steel"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 529-540

TEXT OF ENGLISH ABSTRACT: The XPS has been used to study the composition and structure of the oxide film on stainless steel. The film was formed in the transpassive region during the anodic polarization in H_2SO_4 and after treatment with Na_2MoO_4. It has been found that the ratio of Cr to Fe in the film is about three times higher than that in the bulk. The analysis of the valence states showed

[Continuation of JINSHU XUEBAO No 5, 1981 pp 529-540]

that the distribution of each constituent in the film is not uniform. The film has a three-layer structure. The outer layer is rich in OH^- and the middle layer consists mainly of Cr_2O_3 and Fe_2O_3, while the rest of the layer up to the interface contains the Fe^{2+} and Fe^0. The Mo ions have been found throughout the film. The possible mechanism for passivation of the anodic polarization in the transpassive region was discussed and a comparison was made with other oxide films.

AUTHOR: CHEN Lian [7115 1670]
LIU Minzhi [0491 3046 3112]
SU Huihe [5685 2585 0735]
YIN Wanquan [1438 8001 0356]
et al.

ORG: All of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "A Study of Hydrogen Effect on Deformation and Fracture Microprocess in Pure Iron"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 541-548

TEXT OF ENGLISH ABSTRACT: The effect of hydrogen on the deformation and fracture microprocess in pure iron has been studied by means of the tensile test and observation in S4-10 SEM using cathodic charged specimens. The main results are as follows:
1. With the increase of hydrogen content, namely, from 5.4 up to 31.0 cm^3/100 g, the yield strength increases slightly, the flow stress and fracture strength increase obviously, but the fracture strain decreases remarkably. The lower yield point and Luders band disappear when the hydrogen content exceeds 18.7 cm^3/100 g.

[Continuation of JINSHU XUEBAO No 5, 1981 pp 541-548]

2. The nucleation of a microcrack is predominantly on the slip plane and the microcrack propagates along subboundaries when hydrogen content is below 10 cm^3/100 g. The nucleation of a microcrack is on the grain boundaries and the microcrack propagates in a zigzag way when hydrogen content exceeds 16 cm^3/100 g. The former is a transgranular fracture and the latter is a mixed fracture of transgranular and intergranular type.
3. The characteristics of the hydrogen embrittlement in pure iron are: (1) the slip lines on the specimen surface decrease obviously, and (2) the microfracture of brittle feature is formed and increased. This seems to be due to the fact that the dissolved hydrogen in pure iron decreases the plastic deformation.

AUTHOR: JIANG Jinwen [1203 2516 2429]
LIU Xingzhi [0491 5281 1807]
TIAN Jifeng [3944 4949 6265]

ORG: JIANG of the Institute of the No 1 Steel Works, Benxi Iron and Steel Company; LIU and TIAN both of the Institute of Metal Research, Chinese Academy of Sciences

TITLE: "On the Longitudinal Cracks in 30CrMnSiNi2A Electroslag Ingot"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 549-557

TEXT OF ENGLISH ABSTRACT: The cause and remedy of the longitudinal cracking in 30CrMnSiNi2A electroslag ingot have been investigated. Results show that the cracks are initiated by the microsegregated C, P, S, Si, etc., along the primary austenite boundaries which become fragile and crack under higher thermal stress. Al is injurious due to promotion of the microsegregation of the elements and brittle fracture of grain boundaries rather than formation of the AlN. An effective remedy for longitudinal cracks in 30CrMnSiNi2A electroslag ingot is to keep the residual amount of Al under control if the heat-retaining condition is restricted after stripping the ingot.

AUTHOR: DENG Zhisheng [6772 2655 3932]
WANG Degen [3076 1795 2704]

ORG: Both of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "Crack-tip Fracture Stress under General Yielding of Ligament"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 558-564

TEXT OF ENGLISH ABSTRACT: The criterion of maximum shear stress for crack extension, namely, the critical fracture stress at the crack tip, $(\sigma_{yy})_c = \sigma_F$, was verified as applicable to the ductile fracture in the range between -100°C and room temperature. Considering the independence of this criterion and the critical fracture stress at crack tip upon temperature, the observed phenomen in which J_c decreases with decreasing temperature may be qualitatively explained. The specimen geometry and the curvature radii of notch root are not affected by the average fracture strength, but are affected by the true fracture strain. Therefore, the fracture strength is probably an important descriptive parameter of mechanical properties of materials.

AUTHOR: LIAO Qianchu [1675 0051 0443]
LAN Fenlan [5663 5358 5695]

ORG: Both of the Central Iron and Steel Research Institute, Ministry of Metallurgical Industry

TITLE: "Ideal ECP Maps for Different Cubic Crystals and Their Rapid Indexing Method"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 565-577

TEXT OF ENGLISH ABSTRACT: A set of ideal ECP maps for different cubic crystals was theoretically delineated by using the stereographical projection method of crystal planes. The data given by the maps are tabulated as a new convenient chart for rapidly indexing the ECP of cubic crystals experimentally obtained. This method saves time wasted from that already indexed. The error analysis shows that the present indexing method seems to be available for the cases of the zone axis, both parallel and inclined, and to the optical axis of SEM.

AUTHOR: YU Guocheng [6735 0948 1004]

ORG: Luoyang Institute of Refractory Research

TITLE: "On the Elimination of Polymorphism of Oxide Solid Solutions"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 578-582

TEXT OF ENGLISH ABSTRACT: A thermodynamical study was made of the problem concerning elimination of polymorphism of oxide solid solutions. The understandings on the elimination of polymorphism of ZrO_2 or SiO_2 given by various authors in the past five decades were reviewed, and found to be contradictory. Derivation on elimination of polymorphism has been performed as:

$$x_h(G^0_\ell - G^0_h) > (\Delta G_{mh} - \Delta G_{m\ell})$$

where x_h is the mol percent of solvent in high temperature modification of the solid solution, G^0_ℓ or G^0_h is the free energy of solvent under standard conditions for lower or higher temperature modification respectively, and ΔG_{mh} or $\Delta G_{m\ell}$ is the free energy of mixing of the solid solution for higher or lower temperature modification respectively. It is only in the case of the elimination of polymorphism that the difference between G^0_ℓ and G^0_h is much greater than that of ΔG_{mh} and $\Delta G_{m\ell}$. Due to the identity of the chemical bonds or coordination numbers between high and

[Continuation of JINSHU XUEBAO No 5, 1981 pp 578-582]

low temperature modifications of oxides, these differences are very small and, therefore, the polymorphism of oxide solid solutions possessed of polymorphism originally will not be eliminated.

AUTHOR: Hideji Suzuki

ORG: Department of Physics, Faculty of Science, University of Tokyo, Japan

TITLE: "Yield Strength of Metals and Alloys"

SOURCE: Shenyang JINSHU XUEBAO [ACTA METALLURGICA SINICA] in Chinese No 5, 1981 pp 583-594

TEXT OF ENGLISH ABSTRACT: A review covering the present state of yield strength of metals and alloys is presented. Emphasis is placed on slip and dislocation, multiplication of dislocations, plastic flow rate equation, Peierls stress, temperature dependence of the yield stress and effect of solute atoms.

9717
CSO: 4009/131

AUTHOR: None

ORG: Xikuangshan Mining Administration, Hunan

TITLE: "Practice of Recovering Ore Bodies under a River Bed and Important Buildings Using Cement Filling Method"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 1-6

TEXT OF ENGLISH ABSTRACT: The room-and-pillar method has been used with regular pillars for many years at the South and North Mines of Xikuangshan Mining Administration in order to safeguard the river bed and surface buildings, and, as a result, a lot of safety pillars have had to be left over. Only the safety pillars underlying the river bed below the No 6 level at the South Mine account for 15-30 percent of the total ore within this level. In addition, large open areas left without any support caused several violent large-scale surface subsidences. To avoid this, the mining method with cement filling has been tested and introduced at these mines.

The method features two mining steps: the first is mining the ore ribs followed by cement filling, while the second is mining the rooms followed by tailing filling. Mining areas are divided along the stroke every 60-120 m, with each area subdivided into 6-10 ore ribs and rooms. Stoping starts from the center and advances toward the side wings, with the ore ribs to be recovered first. Rooms are to be mined after the ore ribs on both sides are cement-filled to join the roof.

[Continuation of YOUSE JINSHU No 4, 1981 pp 1-6]

Long term observations have shown that the average monthly surface subsidence has been only 2 mm since the filling method was adopted for recovering the safety pillars under the river bed at the South Mine, which cannot harm mining operation and surface buildings. The recovery has been raised by 12-13 percent compared with the room-and-pillar technology, resulting in production of more than 1670 tons of antimony foods, and more profits have been gained in spite of additional expenses for filling work.

AUTHOR: WANG Mianlin [3769 0517 2651]

ORG: Changsha Institute of Mining and Metallurgy Research, Metallurgical Industry Department

TITLE: "A Study of the YYG-80 Hydraulic Drill"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 7-11

TEXT OF ENGLISH ABSTRACT: In this paper, a series of research works on the YYJ-80 hydraulic drill are summarized. A comparison of advantages and shortcomings between the hydraulic drill and pneumatic drill is carried out, and the principles, structure design theoretical computations, laboratory tests of the YYG-80 hydraulic drill and its field tests are introduced in detail.

AUTHOR: Ove Rehnberg
LAI Haihui [6351 3189 6540]

ORG: LAI of Zhongnan College of Mining and Metallurgy

TITLE: "On the Selection of Low Emission Diesel Engines for Underground Mining"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 19-23

TEXT OF ENGLISH ABSTRACT: A comparison has been made between air-cooled indirect injection (IDI) and water-cooled, turbocharged direct injection (DI) diesel engines (the latter both two-stroke and four-stroke cycle) from the standpoint of exhaust emission, fuel consumption, etc. These comparisons are made mainly on the basis of laboratory tests carried out at the University of Lulea, Sweden.

Our measurements have confirmed that the hazardous emissions from IDI engines are somewhat lower than those from DI engines. This is, however, balanced by important advantages of the four-stroke cycle DI engines, such as lower fuel consumption, lower production and maintenance costs, lower tare weight, etc. Now the future of the DI engine seems to be very bright because sophisticated techniques (the combination of turbocharging, air charge cooling and fuel injection) can lower the NO_x emissions, so in the future it may be that DI engines will be considered more suitable for underground mining than the currently-favored IDI engines.

AUTHOR: WU Haotai [0702 6275 3141]

ORG: Beijing Central Design and Research Institute for Nonferrous Metallurgical Industry

TITLE: "Practice in the Automation of Mine Hoists"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 24-29

TEXT OF ENGLISH ABSTRACT: This article describes the practice and successful experience of the Beijing Central Design and Research Institute for Nonferrous Metallurgical Industry in mining hoist automation since 1963. The author has analyzed the advantages and the applied conditions of two types of motor driving hoists: the automatic AC wound motor driving hoist with dynamic brake, micro-driving, doubly fed with a static frequency converter to adjust the speed and low-frequency driving; and the automatic DC motor driving hoist supplied by motor-converter or thyrister-converter.

The author also presents the idea of "ore transport using computer control and management" to combine underground transport with the hoisting and achieve higher productivity and lower cost in transport and assure more even ore quality.

AUTHOR: LIU Chuanlin [0491 0278 7792]

ORG: Heshan Lead-Zinc Mine, Guangxi

TITLE: "Separation of Copper-Lead Bulk Concentrate by Sodium Silicate Mixture"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 30-33

TEXT OF ENGLISH ABSTRACT: Based on the previous investigation and productive results, the applied research on separation of copper-lead bulk concentrate by the addition of biochromate, CMC, sodium silicate, sodium silicate mixture (I) and sodium silicate mixture (II) was made. The industrial test and comparison of the metallurgical results have shown that sodium silicate mixture, especially sodium silicate mixture (II), is the most effective. From the copper-lead bulk concentrate assaying 3.4 percent Cu and 60.46 percent Pb, the following results of a copper concentrate grade 24.19 percent, with a recovery of 88.99 percent, can be obtained, lead concentrate grade and recovery being 68.70 percent and 99.39 percent respectively. The merits of sodium silicate mixture are as follows: easy making-up; no poison; no odor; good metallurgical results.

Sodium silicate mixture is now being applied at a copper-lead-zinc processing plant and good results have been achieved.

AUTHOR: JIN Wenrong [6855 2429 2837]

ORG: None

TITLE: "Analysis of Precision Concerning Determination of Particle Liberation"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 34-40

TEXT OF ENGLISH ABSTRACT: This article gives some suggestions for increasing the precision of particle liberation determination according to the analysis of factors affecting it. Its emphasis is put on the mathematical analysis of the errors occurring in determination by the plane section and the correction coefficients are related. It has been proved from geometric analysis of the simplified intergrown particles of equal axis which are shown in an adjacent distribution that the probabilities of the intergrowth shown in the plane section, by intergrown particles for valuable minerals that make up 1/2, 1/4 and 3/4, are 0.67, 0.65 and 0.65 respectively; the probabilities for free particles of valuable minerals are 0.165, 0.10 and 0.25, respectively, and the probabilities for gangue free particles are 0.165, 0.25 and 0.10, respectively. The probabilities of intergrowth for the valuable mineral to make up 1/2 by the section for intergrowth in the three kinds of intergrown particles are 0.5, 0.25 and 0.25 respectively; the probabilities of intergrowth for the valuable mineral to make up 1/4 are 0.25, 0.59 and 0.16 respectively, and the probabilities for intergrowth to make up 3/4 are 0.25, 0.16 and 0.59 respectively. The results of the simulated experiment have a rather good

[Continuation of YOUSE JINSHU No 4, 1981 pp 34-40]

agreement with the analytical value of theory. According to the data mentioned above, the concrete method for the stereometric correction of the results from the plane determination is given in the article. The method can make the results corrected from the plane determination more close to the stereometric condition.

The author suggests that by application of mathematical statistics, the reliability of the determined results of the particle liberation can be analyzed. By application of the big samples of some ore samples, the author has proved with K-S examination that the data obtained from the liberation determination for the mixed ore sample fit in well with the normal distribution. So the reliability of the determined results can be analyzed by using the Student's Distribution and the errors can be calculated. This method is simple. The corresponding relation between the amount of the particles determined and the amount of errors can be calculated by substituting the standard deviation of the big samples for that of the population. By doing so, the amount of the particles needed to be determined can be known according to the errors.

AUTHOR: LI Zhenjia [2621 2182 1367]

ORG: Kunming Institute of Technology

TITLE: "The Thermodynamics and Constitution of Binary Silicate Melts"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in English No 4, 1981 pp 41-49

TEXT OF ENGLISH ABSTRACT: In this paper a chemical bonding model is presented to describe the thermodynamics and constitution of binary silicate systems in an empirical way. The proposed parametric functions of chemical bonds lend support to the work of Masson and associates and offer a satisfactory explanation for the anomalies concerning activity, immiscibility and compound formation in the binary silicate.

AUTHOR: TANG Jigang
XU Chuanzhi

ORG: None

TITLE: "Behavior of Sulfur during Selective Reduction Roasting-Ammonia Leaching Process for Extracting Nickel from Laterites"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 50-55

TEXT OF ENGLISH ABSTRACT: The behavior of sulfur contained in heavy oil fuel during the roasting of laterites and the effect of the sulfur on the quality of nickel powder product were investigated from the viewpoint of phase composition and thermodynamics. It was shown that sulfur was almost completely absorbed by calcite in the ore, forming anhydrite ($CaSO_4$) which was, in turn, reduced to oldhamite (CaS) in the subsequent reduction procedure. The latter was exactly the source of unsaturated sulfur in the ammoniacal heazlewoodite (Ni_3S_2) if it had not been oxidized prior to hydrogen pressure reduction. As a result, the total sulfur content in commercial nickel powder would rise to an unacceptable level.

AUTHOR: ZHANG Suolin [1728 4792 2651]

ORG: Hebei Normal University

TITLE: "Studies of Thermodynamics of Aqueous Solutions"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 56-62

TEXT OF ENGLISH ABSTRACT: For the purpose of comparing the stability of all species Mi in M-H_2O systems, we have proposed a new concept--thermodynamically relative stability exponent D, with reference to the most stable elementary substance of the element M, M_1. The exponent for all species Mi was a function of the properties inherent in them and the circumstantial factors, i.e.,

$$D_{Mi} = \frac{x_i F(E - E_i^{\circ})}{2.303RT} + m_i \, pH$$
$$(i = 1, 2, 3, \text{........} k)$$

Applying the set principle to equilibria of the multispecies system, the following equations were obtained:

1. Under given conditions (E, pH, T), the quantity ratio of all species was

$$\{Mi\}^{1/Ai} : \{Mj\}^{1/Aj} : \text{........} = \underset{(E.pH.T)}{10^{D_{Mi}} : 10^{D_{Mj}} : \text{........}}$$

[Continuation of YOUSE JINSHU No 4, 1981 pp 56-62]

2. Over a wide range of E-pH-T, the distribution equation of all species in M-H_2O systems was

$$\underset{\text{space of E-pH-T}}{\sum_{1}^{k} \text{Max}\left\{D_{M_1}, D_{M_2}, D_{M_3}, \cdots\cdots D_{M_k}\right\}}$$

Based on the above equations, a general source program for M-H_2O systems has been compiled with ALGOL and used to compute E-pH diagrams and other thermodynamic data.

AUTHOR: ZHU Yingyao [2612 5391 1031]

ORG: Daye Nonferrous Metal Company, Hubei Province

TITLE: "Discussion on Copper Smelting Technique at the Ancient Tonglushan Mine Smelting Ruins"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 63-67

TEXT OF ENGLISH ABSTRACT: This paper describes the process and results of simulating test of the ancient smelting technique at Tonglushan.

The old shaft furnace for copper smelting and the remaining excavated slag, in combination with the simulating test, have been investigated. The technical problems of the ancient copper smelting technology, the furnace structure, the air blower, the operating technique and the building of the furnace shaft have also been discussed. The author tries to make the ancient copper smelting revive before the readers through discussions of the old smelting technique.

AUTHOR: LI Zhongjun [2621 0112 0971]

ORG: Institute of Natural Science History, Chinese Academy of Sciences

TITLE: "Mercury Ore Producing Areas Recorded in Ancient Literature of China"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 68-70

TEXT OF ENGLISH ABSTRACT: The Chinese people have a long history of using mercury. Long ago, as far back as the Warring States, our ancestors had the knowledge of using gold and silver dissolved by mercury to make gilded gold or silver wares, and using mercury blend as a component of a dose of medicine which had marvelous functions for curing some diseases. According to historical records, this paper describes ancient mercury ore producing areas in chronological order. It will be a great help in the research on the history of mercury production.

AUTHOR: QIU Zhuxian [6726 4554 6343]

ORG: Northeast Institute of Technology

TITLE: "Studies of Reversing Current Electrolysis in the Cryolite-Alumina Molten Salts"

SOURCE: Beijing YOUSE JINSHU [NONFERROUS METALS] in Chinese No 4, 1981 pp 71-72

TEXT OF ENGLISH ABSTRACT: In the cryolite-alumina molten salts electrolysis, the wetting phenomena on the two electrodes are quite different. The anode is poorly wetted while the cathode wetted well. When the current direction is reversed for several seconds, the wettability of the anode becomes better after a short period of "hesitation." There are two good effects:
(1) a decrease of back electro-motive force;
(2) quenching and preventing the anode effect. Therefore, it may be beneficial for decreasing the energy consumption in aluminum electrolysis.

9717
CSO: 4009/132

Optics

AUTHOR: DENG Xeming [6772 6932 6900]
YU Wenyan [0151 2429 3508]
CHEN Shisheng [7115 2514 0524]
et al.

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "The Six-beam Subnanosecond High Power Nd:glass Laser System"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 289-298

TEXT OF ENGLISH ABSTRACT: This paper reports a six-beam subnanosecond high power Nd:glass laser system used for laser plasma research. The characteristics of each of the six beams are the following: the output aperture is ϕ60 mm, pulse width (FWHM) is 100 ps, output energy is about 10 J, energy of super fluorescence is less than 1 mJ, pre-pulse is of the order of μJ, beam divergent angle (HM) is 0.5 mrad. Total output power of the six-beam is 0.6 TW.

AUTHOR: CHEN Jianwen [7115 1696 2429]
FU Shufen [0265 3219 5358]

ORG: Both of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Kinetic Simulation of Discharge-excited XeF Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 299-304

TEXT OF ENGLISH ABSTRACT: Computer simulant results of kinetic processes of discharge excited XeF laser are given. The reaction equations involve formation, quenching of the XeF and absorption processes of Xe_2^+, F^-, Boltzman transport equations, the particle and photo rate equations as well as circuit equation are solved together under inductive radiative conditions. Finally, the calculation results are compared with the experimental values.

AUTHOR: WANG Mingchang [3769 2494 1603]
WANG Wucheng [3769 2745 2052]
CHEN Xingfen [7115 2622 7685]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Analysis of Tuning Linewidth of the Waveguide Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 305-309

TEXT OF ENGLISH ABSTRACT: An intracavity tunable waveguide laser has been developed. Some factors affecting the tuning linewidth are analyzed. The effect of lineshape truncate is calculated quantitatively. The results of the tuning experiments are presented.

AUTHOR: WANG Yumin [3769 5940 3046]
GUI Zhenxing [2981 2182 5281]
ZHANG Shunyi [1728 7311 1837]

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Opto-galvanic Effect Observed in Branch-selected CO Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 311-315

TEXT OF ENGLISH ABSTRACT: In this paper the opto-galvanic effect observed in branch selected CO laser is first reported. The possible microscopic processes are proposed and the application of the effect is predicted.

AUTHOR: ZHOU Zhengzhuo [0719 2398 0587]
QIU Mingxin [6726 2494 2450]
ZHENG Guibi [6774 6311 1801]

ORG: ZHOU and QIU both of the Shanghai Institute of Laser Technology; ZHENG of the Shanghai Power Bureau

TITLE: "Helium Cadmium Laser in an Axial Weak Magnetic Field"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 317-321

TEXT OF ENGLISH ABSTRACT: It was observed in an axial weak magnetic field that the polarization behavior of a helium cadmium laser was changed, the main polarization axis was rotated, and the laser output was modulated due to the change of the axial magnetic field, etc. These phenomena are called generalized Hanle effect. The computer calculation in theory is in agreement with experimental results.

AUTHOR: TAO Chunkan [7118 4783 1030]

ORG: Xi'an Institute of Applied Optics

TITLE: "Degrees of Freedom of Aberrated Images Under the Illumination of Incoherent Light"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 323-329

TEXT OF ENGLISH ABSTRACT: The degrees of freedom of imaging will change when an optical system under the illumination of incoherent light suffers from symmetrical and unsymmetrical aberrations. The reason for this change is given and the equations are derived.

AUTHOR: ZHU Shaoji [4376 4801 4614]

ORG: Shanghai Optical Instrument Research Institute

TITLE: "A Method for Controlling the Groove Shapes of Blaze Holographic Gratings"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 331-334

TEXT OF ENGLISH ABSTRACT: A detailed program concerning the production of blaze holographic gratings with the help of the Fourier synthetic method is suggested. A description of the synthetic groove shapes is given and a comparison with the theoretical value is conducted. The calculation of the phase-shift of light waves under reflection is also given. Experimental equipment which is simple in construction, convenient in adjustment and highly precise is presented.

AUTHOR: LI Chunfei [2621 3196 7378]
JI Jiarong [1323 1367 6954]

ORG: Both of the Department of Physics, Harbin Institute of Technology

TITLE: "An Electrooptic Nonlinear Michelson Optical Bistable Device"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 335-339

TEXT OF ENGLISH ABSTRACT: An electrooptical crystal was inserted in one of the two arms of a Michelson interferometer. The feedback signal was used for phase modulation of the light beam in this arm. Thus the light output intensity, as a result of the interference of two beams, exhibited optical bistability. An integrated optical device version based on this principle was proposed.

AUTHOR: FAN Junying [5400 0193 4481]
WU Cunkai [0702 1317 1956]
WANG Zhiying [3769 1807 5391]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "High Efficiency and Diffraction-limited Dye Laser Beam Generated by Four-wave Mixing"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 341-346

TEXT OF ENGLISH ABSTRACT: In this paper a way of generating a highly efficient and diffraction-limited dye laser beam is proposed. In this dye laser, Rhodamine 6G solution in alcohol is pumped by counterpropagating pumping beams in four-wave mixing. The 5320 A laser radiation from second harmonic of the output of a Nd: laser system consisting of a Q-switched Nd:YAG oscillator and Nd:glass amplifiers is used as the pumping source. The Rhodamine 6G solution is used as both the active medium of the dye laser and the nonlinear medium for four-wave mixing. The concentration of the Rhodamine 6G solution in alcohol is about 5×10^{-5} mole. Using a pumping intensity of about 5×10^{6} W/cm^2, the energy conversion efficiency of the pumping beam to dye laser beam is about 50 percent, and the beam divergence of the laser output is near diffraction-limited. The good quality of the output beam of the new type of dye laser is analyzed theoretically.

AUTHOR: CHENG Lu [4453 6424]

ORG: Department of Physics, Nankai University, Tianjin

TITLE: "The Holographic Information Capacity of Films in the Existence of Random Phase Fluctuations"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 347-350

TEXT OF ENGLISH ABSTRACT: The effects due to random geometrical fluctuations of the surface of films and the random fluctuations of the index of refraction of the films are considered in the deduction of the holographic information capacity of films from the point of view of reconstructed three-dimensional images in the previous paper.

AUTHOR: JIN Feng [6855 6912]
LI Yushan [2621 3768 0810]

ORG: Both of Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "Two Polarization Measurements of Single-mode Waveguide Parameters"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 351-356

TEXT OF ENGLISH ABSTRACT: A two polarization method for measuring single-mode waveguide parameters (thin film refractive index and thickness) was presented, the calculation formulas of single-mode waveguide parameters and the errors in parameter measurements were given, and single-mode glass waveguide parameters were measured. The measurement results showed that this method is simpler than multi-wavelength measurements, and the measurement accuracy is approaching that of multi-mode measurements of waveguide parameters.

AUTHOR: FAN Junqing [5400 0193 3237]

ORG: Changchun Institute of Physics, Chinese Academy of Sciences

TITLE: "The Eigen-mode Expansions of Dyadic Green's Functions for Dielectric Waveguides"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 357-364

TEXT OF ENGLISH ABSTRACT: For dielectric waveguides of an arbitrary profile with step-index and gradient-index, the universal expressions of eigen-mode expansions of dyadic Green's functions for dielectric waveguides have been found by using the operator theory approach. It is shown that the expression of the electric-type dyadic Green's function is the sum of an eigen-mode expansion containing nine dyadic components and a singular term. From these expressions the dyadic Green's function for a dielectric waveguide can be obtained if the eigen-mode of the waveguide is given.

AUTHOR: CHEN Shuqin [7115 3219 3830]
ZHAO Jiran [6392 4949 3544]
GAO Fuyuan [7559 4395 3293]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "A Collinear CS_2 Picosecond Optical Grating"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 365-369

TEXT OF ENGLISH ABSTRACT: A collinear arrangement of optical shutter with ultrahigh time-resolution is introduced. An ultrashort pulse of Nd:glass laser is used as an ignition pulse and CS_2 liquid as Kerr medium. Correlation time of 15 picoseconds has been measured. We obtain values of the full width of half maximum of 1.06 μ ignition pulse and 5300 A signal pulse as 12 picoseconds and 8 picoseconds respectively.

AUTHOR: SHA Cunxiao [3097 1317 1321]

ORG: Beijing Optical and Eyewear Industrial Corporation

TITLE: "An Approach to the Method of Vignetting Determination"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 371-376

TEXT OF ENGLISH ABSTRACT: In this article a specific lens is taken as an example to approach the method of the determination of pupil shape, to stress under certain circumstances the existence of surplus inflection points and its cause using the prevalent cubic interpolating spline and, finally, to put forward two schemes subjected to tests for reference.

AUTHOR: LI Yuanheng [2621 0337 1854]

ORG: Institute of Mechanics, Chinese Academy of Sciences, Beijing

TITLE: "Dynamic Fabry-Perot Interference Effect of Parallel Plane Ge by Intense Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 377-378

TEXT OF ENGLISH ABSTRACT: Experiments show that transmittance of parallel-plane Ge changes quasi-periodically with time under CW CO_2 laser radiation. Based on multi-beam interference theory for parallel-plane and considering the influence of laser-induced temperature change on refractivity and thickness of Ge, the calculated results are consistent with the experimental data. This indicates that parallel-plane Ge has a dynamic Fabry-Perot interference effect on temperature, dependent on refractivity and thickness, by high power CW CO_2 laser heating.

AUTHOR: FAN Dianyuan [5400 3329 0337]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Nonlinear Index in the Gain Medium"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 4, 1981 pp 379-383

TEXT OF ENGLISH ABSTRACT: The nonlinear index of refraction induced by stimulated transition of high level populations in the gain medium is investigated. Taking the example of active Nd:glass, we have specifically calculated the law of index changing with laser intensity. Several physical effects related to this nonlinearity, such as self-defocusing, self-modulation, nonlinear aberration and pulse distortion, etc., are indicated.

AUTHOR: DENG Ximing [6772 6932 6900]
LIN Weiping [2651 0251 1627]
FANG Honglie [2455 3163 3525]

ORG: All of the Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Dynamic Analysis of Transmissions of Paraxial Light Beams"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 385-394

TEXT OF ENGLISH ABSTRACT: In this paper the transmission of paraxial light beams was analyzed based on the gradient vector potential of electromagnetic field.

AUTHOR: FAN Dianyuan [5400 3329 0337]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Optical Transfer Function in Terms of Ray Matrix Elements"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 395-400

TEXT OF ENGLISH ABSTRACT: Starting from the diffraction integration in terms of ray matrix elements, the optical transfer functions have been derived for a complicated optical system. They are also represented by the ray matrix elements and have the following generality: All are permitted in the system in which there are complex lenslike media with quadratic index and gain (or loss) and Gaussian aperture (or Gaussian mirror) with Gaussian transmissivity (or reflectivity); the observation plane can be located at any plane; the location of the aperture can be arbitrary.

AUTHOR: David Casasent
et al.

ORG: All of the Department of Electrical Engineering, Carnegie-Mellon University, Pittsburgh, Pennsylvania (including visiting scholars from the Institute of Optics and Electronics, Chinese Academy of Sciences, PRC)

TITLE: "A Laser Diode/HOE Pattern Recognition System"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in English No 5, 1981 pp 401-408

TEXT OF ENGLISH ABSTRACT: A compact and rugged optical correlator is described. It employs a lensless matched spatial filter that is formed at one wavelength. Correlation is performed with a laser diode at a second wavelength using an imaging lens in a scaling correlator topology.

AUTHOR: CHEN Yansong [7115 1484 2646]
JIANG Changshan [1203 7022 1472]
MING Hai [2494 3189]

ORG: CHEN and JIANG both of the Institute of Physics, Chinese Academy of Sciences, Beijing; MING of the Chinese University of Science and Technology, Hafai

TITLE: "Make Up Kinoform by the Method of Rotation Photograph"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 411-414

TEXT OF ENGLISH ABSTRACT: A method of rotation photography was suggested in which the kinoform with axial rotating symmetry was made up and experimental results of the spherical kinoform were presented. The method reduces the noise caused by discrete phase on reconstructing the image. This method can apply to either spherical or aspherical kinds of kinoforms with axial rotating symmetry.

AUTHOR: WO Minzhen [3087 2404 2398]
WANG Nenghe [3769 5174 7729]
WANG Zhijiang [3769 0037 3068]

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Polarization and Interference in Michelson Interferometer Consisting of Two Corner Prisms"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 415-422

TEXT OF ENGLISH ABSTRACT: The Jones 2 x 2 matrix of the corner prisms is found. Various forms of the Michelson interferometer consisting of two corners are discussed. In the case of the beam in one arm passing through the edge of a corner and the beam in another arm not passing through any edges of another corner, the interferometric field is divided into two parts. The phase difference between these two parts is $\pi/2$ and the fringe contrast in the whole field is over 90 percent.

AUTHOR: DING Peizhu [0002 1014 2691]
PAN Shoufu [3382 1343 3940]

ORG: Both of the Institute of Atomic and Molecular Physics, Jilin University, Changchun

TITLE: "The Abel Transformation of Mach-Zehnder Interferogram Analysis Supersonic Encircling Flow"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 423-432

TEXT OF ENGLISH ABSTRACT: This paper deals with the Abel transformation of Mach-Zehnder interferogram analysis of supersonic airflow about cylindrical or spherical symmetric projectiles containing shock waves. We have investigated some properties of the solution with finite discontinuous points of the first kind for general Abel's integral equation. Applied to the Abel transformation between interference fringe shift $\delta(x)$ and density $\rho(r)$ in Mach-Zehnder interferogram, three conclusions having clear physical meaning are obtained: 1. interference fringe shift $\delta(x)$ laying in a straight line perpendicular to the symmetric axis of the interferogram of the flow field is a continuous function of x; 2. $\delta'(x) \sim L/\sqrt{c-x}$ at $x \to c-$, if if the circle $r = c$, which is in the section I-I, is the shock wave; 3. if the interference fringe shift $\delta(x)$ is smooth except for one sharp point c and limit $\lim_{x \to c_+} \delta'(x)$ exists and $\delta'(x) \sim L/\sqrt{c-x}$ at $x \to c_-$, the shock wave appears at circle

[Continuation of GUANGXUE XUEBAO No 5, 1981 pp 423-432]

$r = c$ in the section in the flow field, the density jump quantity at the shock wave $\Delta\rho = \lambda^{*}L/K\sqrt{2c}$ and the transformation from $\delta(x)$ to $\rho(r)$ is the usual Abel transformation for $r \geq c$ and for $r < c$. Therefore, we present a simple and accurate method of numerical calculation. This method is used for the calculation of $\rho(r)$ from $\delta(x)$ and the calculation of the density jump quantity at shock wave.

AUTHOR: SHI Guanghui [0670 0342 6540]

ORG: Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Correction of Secondary Spectrum with Intrinsic Chromatic Aberration"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 433-439

TEXT OF ENGLISH ABSTRACT: An achromatic lens system may consist of several cemented or separated groups of crown and flint glasses. If there is a value of chromatic aberration in each group and a certain relationship between the positive or negative sign of chromatic aberration and the selection of glasses, the secondary spectrum of the whole lens system can be reduced to any small value. According to this principle, two complicated triplets with secondary spectrum corrected are given as an example. Their focal lengths are 1.5 m, F numbers are 7, and field angles are 15° and 18° respectively. Entirely common glass is used in one of the lenses.

AUTHOR: CUI Junwen [1508 0193 2429]
LI Qun [4539 5028]
HUI Lingkai [1920 0109 0418]
et al.

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Tunable Synchronously Pumped Ultrashort Pulsed Double-beam Lasers"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 441-444

TEXT OF ENGLISH ABSTRACT: This paper reports the experimental results of the ultrashort pulses from two tunable dye lasers, which are synchronously pumped by the second harmonic of an active-passive mode-locked Nd:phosphate glass laser.

AUTHOR: CHEN Jianwen [7115 1696 2429]
FU Shufen [0265 3219 5358]
LIU Miaohong [0491 1181 1347]

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Study of Performance for Discharge Excited N_2^+ Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 445-449

TEXT OF ENGLISH ABSTRACT: The experimental results for the N_2^+ laser are presented. the measured optimum partial pressure of N_2^+ was 2.4 torr at a total pressure of 2 atm in He/N_2 mixture. Kinetics of formation and quenching are analyzed and discussed. The spectra of the N_2^+ laser at 427.8 nm were determined with the second order spectra of a two-meter grating spectrometer. We observed that the 427.8 nm line is a doublet.

AUTHOR: LI Shiying [2621 1102 5391]
CHEN Shaohe [7115 4801 0735]
XIE Ziming [6200 2737 6900]

ORG: All of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "A Transient Acousto-optically Mode-locked Nd:YAG Laser"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 451-456

TEXT OF ENGLISH ABSTRACT: An acousto-optically mode-locked Nd:YAG laser, prelasered with an electro-optic Q-switch, energy storage amplified, and modulated with an acousto-optic modulator operated at 50 MHz, is described. In the case of embedding a dye-cell into the cavity, the mode-locked laser can be operated either actively or passively. The performance of this laser is as follows: the pulse width varies continuously from 20 ps to several ns, energy of a single pulse is greater than 0.1 mJ, and the amplitude stability of the pulse train is better than 90 percent.

AUTHOR: WANG Wengui [3769 2429 2710]

ORG: Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences

TITLE: "Model JQY-300 Laser Holographic Interferometer"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 457-462

TEXT OF ENGLISH ABSTRACT: The model JQY-300 laser holographic interferometer is an instrument used for uniformity measurement of large pieces of optical glass by means of double-exposure holographic differential interferometry. The measurement accuracy of $\pm 5 \times 10^{-7}$ can be obtained.

The characteristics of structure design are as follows:
1. Foamed rubber is used as vibration-proof leading to a simple construction, and 8~9 Hz vibration can be isolated.
2. The optical path difference introduced by work-table deformation under heavy sample is eliminated using the method of placing the sample holder at the support point.
3. The sample mount consists of a three-dimensional angle micro-adjust structure instead of the commonly-used "point, line, plane" positioning structure. It is convenient for machining, assembly and the accuracy requirements can be met.

AUTHOR: LING Dehong [5677 1795 3163]
ZHANG Chenghua [1728 3397 5478]
WANG Ce [3769 4595]

ORG: All of the Laser Research Section, Jiangsu Teachers College, Suzhou

TITLE: "The Experiments of Word Translation with Fourier Hologram"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 463-468

TEXT OF ENGLISH ABSTRACT: A Fourier hologram with informations in the reference beam can be used as a holographic translator. The analysis made is based on the reciprocity of object beam with reference beam and experimental results are presented in this paper. The effect has been improved through the spatial amplitude modulation.

AUTHOR: SONG Weiguang [1345 4850 0342]
CHENG Zhongren [2052 1813 0088]
LI Ge [2621 2047]

ORG: All of Tianjin Laser Technique Institute

TITLE: "Memory Limit of Point Holographic Images"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 469-474

TEXT OF ENGLISH ABSTRACT: It is expected that, on the Fourier-transform plane of objective lens, the point holographic image formed by object beam and reference beam is capable of higher memory density of Chinese characters and other foreign letters. Therefore, the memory limit which is related to the relative aperture F of the objective lens, the wavelength of the illustrating light and the number of terms of frequency and spectrum in the image are discussed. All of these have been identified by our experiments.

AUTHOR: ZHU Jibin [4376 4949 1755]
HU Xin [5170 9515]

ORG: Both of Hanjiang Institute of Precision Machine Tools, Hanzhong

TITLE: "Pulsed Mode and Differential Mode Zero-setting Gratings"

SOURCE: Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese No 5, 1981 pp 475-479

TEXT OF ENGLISH ABSTRACT: The description of existing pulsed mode zero-setting gratings in connection with their imperfections in the theory relevant to the locating accuracy is given. At the same time, a new type of zero-setting gratings, namely, of the differential mode zero-setting gratings, is suggested in this paper.

9717
CSO: 4009/141

AUTHOR: ZHU Lianfang [2612 5571 5364]
MA Baolin [7456 1405 2651]

ORG: Both of Lanzhou Geological Institute, Chinese Academy of Sciences

TITLE: "Sedimentary Facies and Oil Possibilities of the Lower Cretaceous in the Western Part of the Jiuquan Basin"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 4, 1981 pp 11-22

TEXT OF ENGLISH ABSTRACT: Based on analyses of the characteristics of the cumulative probability curve of particle size and of the depositional characteristics (including lithology, fabrics and paleontology), the sandstone bodies of Lower Cretaceous in the western Jiuquan Basin are divided into 13 genetic types in 5 depositional systems: the diluvial fan deposits, the fluviatile deposits, the deltaic deposits, the littoral deposits and the turbidites. Differences of sandstone bodies deposited under varying environments are described.

Study of the evolution of the sedimentary facies in early Cretaceous in the basin suggests that it underwent expansion and contraction of the water body twice during the period, resulting in the widespread water encroachment in the early part and the reduced scope of encroachment in the later part. The former was favorable for oil generation and the latter for sandstone reservoir formation.

AUTHOR: JIN Wanlian [3088 8001 6647]
XUE Shuhao [5641 0647 3185]
QIU Yunzhen [6726 0061 6297]
et al.

ORG: All of the Scientific Technological Institute, Liaohe Oil Field

TITLE: "Turbidites in the Third Member of Shahejie Formation of the Depression in the Western Part of Liaohe Basin"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 4, 1981 pp 23-30

TEXT OF ENGLISH ABSTRACT: The Liaohe Basin is a down-faulted basin of the rift valley type. In the course of development of the rift valley when rapid sinking of the basin and intensive uplifting of the surrounding mountains occurred, weathered materials from the denudated areas poured directly into the deep lake basin along the slope as turbulent flow deposits that formed turbidites as have been identified through studies of paleoecology, structural sequence, grain size combination and petrography.

The turbidites consist of two EW trending systems controlled by the source of materials supply on the two sides. They may be classified into fault-trough type, fault-valley type and canyon type, distributed in three main zones of slump facies,

[Continuation of SHIYOU XUEBAO Vol 2 No 4, 1981 pp 23-30]

proximal facies and distal facies. The principal oil bearing zones are at the junction of the slump and proximal facies zones and in most parts of the proximal and distal facies zones. In the vertical section, the reservoirs are chiefly in the middle and upper parts of the sandstone formation. As the reservoirs are at places enclosed by source rocks with abundant oil supply, they may be highly prolific locally.

Judging from the trend of turbidite development, we may expect to find oil pools to the south of Huanxiling, Shuangtaiz and Qingshui, etc.

AUTHOR: ZHANG Zhencai [1728 2182 2088]
CHEN Xianzhong [7115 3759 1813]
ZENG Xianzhang [2582 2009 4545]

ORG: All of the Exploration and Development Research Institute, North China Oil Field

TITLE: "Sterane and Terpane in the Crude Oil and Source Rock of the Beijing and Tianjin Region"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 4, 1981 pp 31-37

TEXT OF ENGLISH ABSTRACT: Based on the study of the chromatogram of terpane m/e 191 fragment, the five types of crude oil from the Beijing and Tianjin region are divided into two groups, one with abundant terpane and the other with only a small amount of terpane. It is believed that the oil in the third member of the Shahejie Formation (Es_3) comes primarily from the Es_3 source rock, and the crude oil in the fourth member of Shahejie (Es_4)-Kongdian Formation and the buried hill comes from Es_4-Kongdian source rock.

By using the parameters of sterane isomers, five sources are determined for the crude oil of the region, among which four are of a single origin and one is of mixed origin.

AUTHOR: CHEN Zhongxiang [7115 6945 4382]
CHEN Yuguo [7115 0060 2654]

ORG: Both of the Scientific Research Institute for Petroleum Exploration and Development, Beijing

TITLE: "Fluid Displacement in a Medium with Double-porosity in the Gravitational Field"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 4, 1981 pp 39-50

TEXT OF ENGLISH ABSTRACT: The theory of fluid displacement in a medium with double-porosity has been generalized to include the effects of gravity. Various situations of fluid displacement in the gravitational field are thoroughly investigated, thereby giving a theoretical basis for efficient production of oil from carbonate reservoirs with bottom water.

AUTHOR: BAI Songzhang [2672 2646 4545]

ORG: Exploration and Development Research Institute, North China Oil Field

TITLE: "Mechanism of Water Drive in Carbonate Pools with Bottom Water Relative to the Rule of Its Movement"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese Vol 2 No 4, 1981 pp 51-61

TEXT OF ENGLISH ABSTRACT: The development of the massive carbonate reservoir with bottom water in the Wumishan Formation in the Renqiu Oil Field reveals that for the successful development of an oil field of this type, it is imperative to study the mechanism of displacement of oil by water together with the rule of bottom water movement on the basis of oil field geology.

Combining theory with practice and summarizing the data of oil field development and the results of simulation tests, the author examines the dynamics of water drive in carbonate reservoirs with dual porous media as well as the rule of bottom water movement and proposes a number of measures for tackling some of the basic problems relating to the improvement of oil field development.

9717
CSO: 4009/151

AUTHOR: FENG Rui [7458 6904]
ZHU Jieshou [2612 0094 1108]
DING Yunyu [0002 7291 3768]
CHEN Guoying [7115 0948 5391]
HE Zhengqin [0149 2973 0530]
SUN Kezhong [1327 0344 1813]
et al.

ORG: FENG, CHEN, and HE, et al., all of the Institute of Geophysics, State Seismological Bureau ; ZHU of Chengdu Geological College; DING of the Seismological Bureau of Shanxi Province; SUN of the Institute of Geophysics, Chinese Academy of Sciences

TITLE: "Crustal Structure in China from Surface Waves"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 4, Nov 81 pp 335-350

TEXT OF ENGLISH ABSTRACT: In this paper, numerical inversion from surface wave dispersion gives the layered structures for some regions in China.

The results of this work show that the crust in China can be divided into five continental major blocks: Tibetan Plateau, Mongolian Plateau, North China, South China and Tarim Basin. In general, there are three layers (sediments, granitic

[Continuation of DIZHEN XUEBAO Vol 3 No 4, Nov 81 pp 335-350]

and basaltic layers) in the crust. The seismic wave velocities in the upper mantle and basaltic layer for the latter four regions are almost the same. The average velocities in Tibet and in North China are lower than in the other regions and the lateral heterogeneity is quite obvious. The Conrad interface is not a steady and sharp discontinuity. In some parts low velocity layers do exist, and the high seismicity in these two regions is directly related to the deep crustal structure. The crusts of the other three regions show some characteristics of stable platform. The coastal crust can be divided into two regions by the mouth of the Changjiang River, belonging to the crusts of North and South China repectively.

The crustal thicknesses in China are 32-40 km for East China, 60-70 km for Tibet. The thickest sedimentary layer is found in the Tarim Basin amounting to about 11 km, but for other regions it is generally 3-8 km.

AUTHOR: YANG Jingchun [2799 2529 2504]
LIN Weifan [2651 0251 0416]
JIANG Ming [5592 6900]
LI Geping [2621 2706 1627]

ORG: YANG of Beijing University; LIN, JIANG and LI all of the State Seismological Bureau

TITLE: "Recent Tectonic Movement of the Babaoshan Fault near Beijing and Its Relation to Earthquake Occurrences"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 4, Nov 81 pp 390-398

TEXT OF ENGLISH ABSTRACT: Based on the geological framework, ground level deformation, underground water level changes and seismicity data, the character of the recent tectonic movement of the Babaoshan Fault has been investigated. It is shown that during the time period from 1972 to the Tangshan earthquake of July 1976, the type of tectonic movement of this fault was different for different intervals of time. Before September 1973, it was tensional and right lateral; after that time the movement became compressional and left lateral, and until the Tangshan earthquake there was accelerated movement along that fault for a short duration accompanied by variations of underground waver level, starting from the southern portion toward the north in three deep wells drilled into bedrock on the western side of the fault.

[Continuation of DIZHEN XUEBAO Vol 3 No 4, Nov 81 pp 390-398]

In June 1973, the water level began to rise first in the Xiexigang well to the south, and then in July and October the water levels in the Dahuichang well and the Banqiao well to the north rose respectively. On the other hand, from April to July of 1975, obvious lowering of the water level was observed in the wells. First, the water level in the Xiexigang well began to descend in April and then that of the Dahuichang well and the Banqiao well also lowered in May and July respectively.

It was noted that while the water level of the Dahuichang well was lowering, there was also ground level deformation around that well.

All such phenomena may be explained as the effect of the creep of the Babaoshan Fault which was transmitting from the southwest to the northeast gradually. For more than 10 years, a small earthquake in the vicinity of the fault was concentrated in a zone to the northwest of this fault and to the southwest of the northwest-trending Nankou-Sunhe Fault. It might be explained as the result of the barrier effect of the latter to the northeasterly creep movement of the Babaoshan Fault.

AUTHOR: JIANG Jinchang [5592 6930 2490]
LIU Xiangqun [0491 0686 5028]

ORG: Both of the Institute of Biophysics, Chinese Academy of Sciences

TITLE: "A Study of the Relation between Acoustic Emission and Unusual Animal Behavior Prior to Earthquakes"

SOURCE: Beijing DIZHEN XUEBAO [ACTA SEISMOLOGICA SINICA] in Chinese Vol 3 No 4, Nov 81 pp 429-439

TEXT OF ENGLISH ABSTRACT: This paper is an analysis of some observed results of acoustic emission prior to earthquakes occurring in the last 10 years in China for the temporal and space distribution pattern of such acoustic emissions before large earthquake events and an estimation of the transmitted sound pressure above the bed rock and in surface water. The distribution pattern was then compared with that of unusual animal behaviors before earthquakes. In addition, the threshold values of sensation to hearing and vibration of humans and some animals have also been compared. Finally, a cross-correlation analysis of the observed acoustic emission and the activities of fish during the aftershock of the Tangshan earthquake for the same time intervals was made. The results are as follows:

1. The pattern of temporal and space distribution of acoustic emission and anomalous animal behavior before earthquakes are generally similar. They are commonly referred to as the earthquake short-term precursors.

[Continuation of DIZHEN XUEBAO Vol 3 No 4, Nov 81 pp 429-439]

2. Transmitted sound pressure of acoustic emission before an earthquake of the magnitude around 3 near the epicentral region above the bed rock and in the surface water equals respectively 23-19 dB and 90-86 dB in the frequency band of 150-250 Hz. It can be seen that human ears are not able to sense this sound pressure level on the ground surface, but possibly cats, dogs and pheasants on the ground surface and usually rats living in holes can sense it, and perhaps teleost fish are superior to ground animals in sensing acoustic emission prior to earthquakes. At the same time, the vertical amplitude of displacement of the bed rock surface amounts to about 10^{-7} cm. Although this value is about three orders of magnitude lower than the amplitude thresholds of sensation to vibration for some animals, we might infer that the vertical amplitude of ground surface displacement before strong earthquakes can be of the order of microns or more, so that they should be able to sense the vibrations.

3. When the observational sites for the activities of fish and acoustic emission are about 20 im apart, the results show that they reflect not only the aftershock activity of the same regions in Tangshan, but also certain cross-correlations between the sequences of daily frequency of activities of fish and acoustic emission.

9717
CSO: 4009/153

Textile Research

AUTHOR: None

ORG: None

TITLE: "Provincial Chemical Fiber Technology Specialty Conference Held in Sichuan"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 5, 81 p 56

ABSTRACT: Sichuan Province and Chongqing City Textile Engineering Society Chemical Fiber Specialty Committee held a 1980 Chemical Fiber Annual Conference on 20-28 Mar 81 at the Sichuan Vinylon-fiber Plant. Participants included 44 delegates representing ten plus provinicial, municipal, commercial, manufacturing, educational, and research organizations. Some members of the plant attended as nonvoting participants. The conference received 31 papers, 12 of which were exchanged during the meetings. The Chairman, Prof. LI Shengping [2621 0581 1627] of Chengdu University of Science and Technology reported on new developments in chemical fibers and the modification of vinylon fibers. WANG Dapeng [3769 1129 7720] of the plant introduced impressions of his observation trip in Japan. The spirit of democracy was maintained throughout the conference. The participants expressed their opinions freely, summarized their own experiences, and exchanged with others. Finally, it was resolved that the 1981 Annual Province-wide Conference of Chemical Fiber Technology will be held in Mar 82 in Chengdu and the discussion will enphasize ways of reducing the cost and improving the quality of chemical fibers.

AUTHOR: TANG Wenhui [0781 2429 6540]

ORG: None

TITLE: "Certification of the YJ1A-120 Drawing and Roving Machine"

SOURCE: Shanghai FANGZHI XUEBAO [JOURNAL OF TEXTILE RESEARCH] in Chinese No 5, 81 p 12

ABSTRACT: For the purpose of improving the quality of drawing rollers, the Bureau of Machines of the Ministry of Textiles resolved in 1978 to design a new series of drawing machines. With the bureau in charge of the project, the designing work of the YJ1 series was performed by Changde Textile Machinery Plant, and the YJ1-120 fine cotton yarn drawing machine was experimentally made by the Shanghai Textile Machinery Plant No 3. In order to facilitate future reconstruction of the old machines, Shanghai Textile Machinery Plants No 3 and No 2 decided to work jointly in designing the YJ1A-120 which is a combination drawing and roving machine, which is purposefully made to feed the A513 fine cotton yarn spinning frame. On 2 Jul 81, the Shanghai Bureau of Textile Industry was requested by the ministry to call a certification meeting at the Shanghai Cotton Plant No 5 to appraise the finished product. The meeting was attended by 40+ delegates of related organizations. Following various tests, the machine was found to meet the quality requirements of pure or mixed cotton yarn of less than 35mm. After several existing problems are resolved [the paper gives no details about these problems], the delegates agreed, the machine may proceed to the intermediate test production stage.

6168
CSO: 4009/123

Total Quality Control

AUTHOR: YANG Jinting [2799 6855 1656]

ORG: None

TITLE: "Preliminary Success of Promoting TQC [Total Quality Control] in Hunan Province"

SOURCE: Beijing ZHILIANG GUANLI [QUALITY CONTROL] in Chinese No 5, 29 Oct 81 p 16

ABSTRACT: In the 2 years following the extension of TQC in Hunan Province, some improvements have definitely been gained. The indications are as follows: (1) Gradual extension of TQC education: To date, 16 classes sponsored by the Provincial Economic Committee and various special bureaus have trained 1600 persons and 22 percent of the province's 3.2 thousand workers have received some form of TQC education. (2) Industries gained TQC experience: The province has established TQC test points in 284 enterprises (12.5 percent)to carry out strict systems of responsibility, accounting, awards and penalties and the quality of products has been continuously improving. (3) QC teams organized by the masses: The province now has 2967 QC teams. At the conference of representatives of these teams last year, 94 items of achievements were announced and of these 58 items resulted in reduction of waste to save the state 4.05 million yuan. (4) The quality of products has improved: According to statistics of the 7 bureaus of metallurgy, machinery, chemical engineering, light industry, transportation, coal, and construction materials, of the 186 products rated the quality of 169 (91 percent) showed an improvement over the quality of products made in 1979. Outstanding problems in TQC management are briefly mentioned.

6168
CSO: 4009/143

AUTHOR: SUN Zhimin [1327 3112 3046]

ORG: Jinzhou Vacuum Instrument Plant

TITLE: "The KLD-500 Hollow Cathode Ion Coating Machine Certification Conference Held Jointly by Jinzhou Vacuum Instrument Plant and the Research Institute of Metals Chinese Academy of Sciences in Shenyang"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 5, 25 Oct 81 p 72

ABSTRACT: Hollow cathode ion coating is a new ion coating technique developed in the 70's. The vacuum requirement is low, the equipment is simple, the work is safe, and it does not pollute the environment. Abroad, the technique is being applied to deposit a film of Cu, Ag, quartz, Cr, CrN, CrC, TiN, TiC, etc. Industrial equipment of this technique has been in operation in Japan. In China, its research began in Apr 80, carried out jointly by Jinzhou Vacuum Instrument Plant and Research Institute of Metals Chinese Academy of Sciences. Design and manufacture of the KLD-500 hollow cathode ion film coating machine were completed in Mar 81. In half of a year's test operation, the institute (in Shenyang) succeeded in using the machine to coat a layer of imitation metallic titanium nitride on stainless steel, and produced a big batch of imitation metal watch cases for the market place. On 2-3 Sep 81, a conference was held in Shenyang to appraise the machine. Delegates at the conference agreed that the machine is a success and the technique mature, and approved its gradual experimental production to meet urgent needs of the country. Jinzhou Vacuum Instrument Plant has begun to prepare for its production in small batches.

AUTHOR: WANG Ruilin [3076 3843 2651]
DONG Zhenxi [5576 2182 0823]

ORG: None

TITLE: "China Vacuum Society Technique of Achieving Vacuum Specialty Committee Established in Shenyang and Held Its First Scientific Conference"

SOURCE: Shenyang ZHENKONG [VACUUM] in Chinese No 5, 25 Oct 81 inside back cover

ABSTRACT: The conference for the establishment of the China Vacuum Society Technique of Achieving Vacuum Specialty Committee and its first scientific conference was held on 10-14 Sep 81 in Shenyang. Delegates representing 9 provinces (cities), 13 systems, and 46 research units, schools of higher education, and industries attended. This has been the great meeting of specialists of the field of vacuum, following the conference for establishing the Vacuum Metallurgy Specialty Committe and the Application of Vacuum in Electronic Devices Specialty Committee of the society. This conference received 66 papers, reviewing the various achievements in vacuum technology in China since the establishment of the China Vacuum Society in 1979. Scientific activity plans for 1982 and 1983 were discussed and formulated, along with a general examination of trends of development of techniques for achieving vacuum.

6168
CSO: 4009/138

END